DOCUMENT RESUME

ED 056 975 SP 005 357

AUTHOR	Sutman, Francis X., Ed.
TITLE	What Kind of Environment Will Our Children Have?
INSTITUTION	American Association of Colleges for Teacher Education, Washington, D.C.
PUB DATE	71
NOTE	86p.; Proceedings of the AACTE/OAS Conference on Education and the Environment in The Americas, Washington, D.C., October 19-22, 1970
AVAILABLE FROM	AACTE, 1 Dupont Circle, N.W., Washington, D.C. 20036 ($2.50)
EDRS PRICE	MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS	Conference Reports; *Ecology; *Environmental Education; Interdisciplinary Approach; International Programs; *Teacher Education

ABSTRACT

This collection of speeches is divided into five parts. In Part I, Paul Brandewein outlines 13 basic propositions on the environment and how man has violated them, and then suggests a strategy for change. In Part II, Herminio Lugo Lugo discusses the education campaign which Puerto Rico has mounted to confront pollution; E. Wesley Menzel outlines three broad areas for consideration in designing new environmental education programs; and Fabio Heredia-Cana discusses man's lack of respect for his environment. In Part II, two critical topics receive scrutiny: urbanization, in a speech by Paul Peachey, and population education, in a paper by Stephen Viederman. A third paper, by Maria T. Cano offers ideas on materials for population education in the schools. Part IV presents two views on environmental education. George E. Lowe emphasizes the need for a nationwide program, while Edward H. Seymour notes the responsibility of each individual for envrionmental balance and discusses industry's role. Part V contains four brief descriptions of current programs and research in environmental education, with speeches by Richard Miller, J. Leonard Johnson, Alan M. Voelker, and Richard M. Bingman. Conference recommendations for preservice general and professional education of teachers and for graduate and inservice teacher education emphasize the multidimensionality of environmental studies and the need for an interdisciplinary approach. (A list of conference delegates and participants is included.) (RT)

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WHAT KIND OF ENVIRONMENT WILL OUR CHILDREN HAVE?

Proceedings of the AACTE/OAS Conference
on
Education and the Environment
in
The Americas

EDITED BY FRANCIS X. SUTMAN

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Sponsored by
American Association of Colleges for Teacher Education
and The Organization of American States

Held in Washington, D. C. October 19-22, 1970

Published by
AMERICAN ASSOCIATION OF COLLEGES FOR
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Standard Book Number: 910052-52-2
Library of Congress Catalog Card Number: 76-183145

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FOREWORD

This book reflects the current concern throughout the world for the need to create and develop a much greater emphasis on environmental education. The addition of the environment as one more variable dependent upon education increases the load of those in the field of education to meet societal requirements. And this is particularly true for those of us in the critical area of teacher education.

The American Association of Colleges for Teacher Education, which has worked to improve the training of teachers since its founding more than 50 years ago, is fully aware of the need for environmental education. The Association, composed of more than 850 colleges and universities, recognizes that such education must not be considered as one more discreet field of study. Rather, the thrust of AACTE is toward the development of a dimension or an orientation integrated into all of teacher education so that every new teacher, whatever his specialty, is capable of enabling students to achieve those attitudes and values necessary for man to regain a balanced relationship with his environment. The scientific knowledge and technical skills are obviously necessary, and AACTE is concerned with improving the teaching of these. But, more than anything else, *environmental education involves the teaching about value judgments and the ability to think clearly about complex problems which are as political, economical, and philosophical as they are technical.*

Environmental problems are not limited by international boundaries. Thus, the Association was pleased to cooperate with The Organization of American States in sponsoring a conference, *Education and the Environment in the Americas,* in October 1970, which served as the original impetus for this volume. The discussions and papers given at this hemispheric conference and presented in edited form in the following pages bring out clearly the fundamental unity of our environment and the repercussive effects on it by human actions. The degradation of our environment cannot be halted by any single country or by people acting alone; it will require the careful cooperation of all states, as illustrated by the heavy interest in the United Nations Stockholm Conference on Human Environment. The point stressed at the AACTE/OAS conference is that *in order for governments to be able to make the treaties and agreements which can alleviate our environmental crisis, there is a great need for an ecologically educated citizenry in every country.* Hence, it is most appropriate that Americans, both North and South, come together to share ideas and strategies in the area of environmental education.

AACTE commends Francis X. Sutman, Temple University, who coordinated the conference with the assistance of Laszlo Hetenyi, Oakland University; Milton Pella, University of Wisconsin; and Craig Sipe, State University of New York, Albany. The AACTE Committee on International Relations and Frank Klassen, AACTE associate director, provided valuable direction and guidance. Financial support in addition to that provided by AACTE and OAS was made available by the Barra Foundation and the General Electric Company.

EDWARD C. POMEROY,
Executive Director, AACTE

September 1971

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INTRODUCTION

What kind of an environment will our children have?

As 225 delegates from 15 western hemispheric nations gathered in the Pan American Health Organization building in Washington, D.C. for the opening session of the Conference on Education and the Environment in the Americas, this challenge came from keynote speaker Paul F. Brandwein. Implicit in the question are several crucial themes which underlined the conference. First, *environment* itself has come to be acknowledged by most nations as a topic of high priority. Second, *what kind of an environment* implies that man has the option to exercise some control over his environment and the quality of life it might offer. Just as he can dump raw sewage into rivers and fill the densely populated inner city with exhaust fumes, man can also seek and find alternatives to such pollution.

Third, in the final part of Brandwein's question—*will our children have*—education steps to the fore of the environmental picture. While newspaper headlines which decry polluted rivers, DDT after-effects, trash removal headaches, and mercury-contaminated fish help detail the effects of man's past inattention to problem solving, it must traditionally fall to education and its classrooms to introduce the positive side of the coin in helping students understand interrelationships of organisms to the environment for some degree of ecological peace.

The classroom cannot provide this kind of *learning environment* unless the teacher educator becomes a prime resource person. Those who teach teachers who, in turn, teach our children, must assume a heavy share of the load by bringing to prospective teachers the widest dimensions and the deepest implications of environmental education, particularly in relation to human reason and values. "We should never forget," speaker Abraham Horwitz reminded the delegates in the conference's opening session, "that the work of the teacher has the highest multiplier effect of any activity known to man."

These parts of Brandwein's question reflect the focal points of the four-day conference. Sponsored by the American Association of Colleges for Teacher Education and The Organization of American States, the sessions brought together educators, scientists, social scientists, administrators, and personnel from government agencies and private foundations to discuss the larger environmental education picture and exchange ideas on how teacher education can help develop programs in environmental education.

Throughout the AACTE/OAS conference, key topics kept recurring in the speeches and discussion sessions: cooperation between countries, underscoring the commonality of national problems; use of an interdisciplinary approach in teaching environmental education, emphasizing the complexity; and development of an ecological literacy among teachers and students, underlining the positive goal of understanding the ecological picture.

Presentations by Brandwein, Menzel, and Viedermen spoke particularly to the general attitudes which must be developed in teachers if they are to help their students understand what environment is. These four presentations affected most directly the recommendations of the conference with the common message that *only teachers who themselves are concerned about their environmental community will develop similar behavior in their students.* These behaviors are best developed by faculty and prospective teachers working on real problems which depend for solution upon the knowledge of many disciplines.

Many spoke of things well known to emphasize again the wide range of problems. Herminio Lugo Lugo, for example, painted a classic word picture of the great city: "New York City chokes on its daily production of 1,200 tons of garbage; its air is befouled and makes breathing difficult, especially when a thermal inversion occurs; and the Hudson River has become an enormous disposal for dumping domestic and industrial waste."

Others spoke hopefully of actions to come. George E. Lowe tried to envision the breadth of environmental education as it might develop; "It is not just conservation education, resource management, or even nature walks. It is not just about population explosions, nor is it simply sex education. It is all of these . . . and more. It is history, economics, sociology, math, music, and religion. It is multidisciplinary. . . . It affects most everything."

Some told of teacher education programs already planned or implemented even in this early stage of environmental education.

The proceedings of this first hemispheric conference in environmental education are offered by the American Association of Colleges for Teacher Education and the Organization of American States in the spirit that they will stimulate further progress on the subject throughout the world. It is traditional within most nations to turn to their educational institutions when crises like the environmental one arise; it is equally traditional that these institutions meet the challenge.

Francis X. Sutman

PART I:
SOUNDING THE CHALLENGE

As a self-endangered species, man is in critical need of an environmental bill of rights to ensure a healthy environment. Paul F. Brandwein underlines the crisis with 13 basic propositions on the environment and how man has violated or complicated them, then suggests a strategy of reasonableness and some policies which cover the immediate and the long-range. Rather than asking how the environment should be conserved, he argues, educators should consider: What kind of a world do we want for our children?

SURVIVAL AS A QUESTION

PAUL F. BRANDWEIN*

One of our major philosophical and practical dilemmas is that, in our modern world, there are truly no solutions—only ameliorations. We have become, in fact, a self-endangered species.

Put simplistically, our problems are to reconcile human and philosophical man with esthetic man, to conciliate technology and spirit, to wed man to nature once again. We need to bring political man, economic man, intellectual man, esthetic man, and ethical man into a clearer focus.

I suggest *an ethical pragmatism* for those who use the land for esthetics and those who use the land for technics. Foreign observers seldom fail to point out the American characteristic of loving their country not as it is, but as it will be for their children and their children's children. If this is true, then, the main processes by which this hope will be attained in our open society are social and political. The processes by which governing bodies—public and private—make plans, set rules, and implement them are, for all practical purposes, political.

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* President, Center for the Study of Instruction, Harcourt Brace and Jovanovich, Inc. and Adjunct Professor, University of Pittsburgh, Pennsylvania

In actuality, however, most of us leave political activity *per se* to the professional politicians and become concerned only when we come into conflict with them. Most of us, perhaps, have come to view politics as the resolution of conflict for constructive ends such as peace, law, order, or prosperity or of conflict in the interests of a sanative or healing environment.

Some have defined politics as the "art of the possible." The number of rules and the power of government, the definition implies, should not exceed what is absolutely necessary. It is here that many conservationists have found cause for dismay in one of two extremes: that government does not make sufficient decisions or that government makes too many rules. Nevertheless, political activity attempts to develop those decisions through which fruitful interaction is maintained generally in the direction of peace and prosperity. Within the context of our system of representative democracy, the power to conserve the environment is in the hands of the politically active.

In seeking a pragmatic stance for this conference, I have thought of the political process as related to a conservation program in terms of:

who gets what, how
he gets what he
gets, and when.

In other words, *whose* expectations will be satisfied, *how*, and *when*.

Let me begin with *what: Conservation is man's recognition of his interdependence with the environment and with life everywhere to sustain a culture which will maintain a sanative or healing environment.*

What, therefore, implies an environmental bill of rights to ensure a sanative environment. In his book *So Human An Animal*, Rene DuBois argues that quiet, privacy, independence, initiative, and open space are biological necessities rather than frills or luxuries. He states: "To realize the multifarious biological and spiritual potentialities of mankind requires an immense diversity of environments." Man, DuBois contends, must return to the "wooing of the earth."

The time is irrevocably now. In this day and age, conservation can no longer be cautiously defined as a wise use of resources, but rather by the sober injunction to organize shortage.

Let me underline this urgency with 13 propositions.* I borrow freely from Aldous and Julian Huxley, Garret Harlen, George Gaylord, Arnold Toynbee, and others. Under each proposition, I shall comment on how man has tampered with its implications.

1. *The present million or so species of organisms, including man,*

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*Propositions were first presented to a colloqium of conservationists at Humboldt State College in July 1968 and subsequently published in the November 1969 issue of *American Forests*.

have come out of a history traversing several billion years – presumably from one primitive organism.

We need to understand that each species has a long and honorable history and that man is not master, but co-inhabitant. But, man destroyed the passenger pigeon. He destroyed the dodo. The Wildlife Federation has a growing list of species in danger of extinction – the pasque flower, the bald eagle, the rhinoceros, and the elephant, among others.

2. *The environment available to organisms is limited; further, within any species, the organism is adapted to a special environment and has a special ecological niche. In all probability, no two species occupy the same ecological niche.*

But, about 10 thousand years ago, the trouble began when man began to favor cultivation of food stuffs over hunting and food-gathing. He has since then increased the greenhouse effect to such a point where there has been a significant rise in the average temperature. Some calculate that another five or six degrees would endanger the polar icecaps. On the other hand, others submit that the increasing blanket of particles which man's technology cannot seemingly prevent from escaping into the atmosphere will filter out some quantity of the sun's energy.

The sum and substance is that, while almost all other species fit their ecosystems, man does not. He is either unable or unwilling to control the capabilities of his brain. He is not yet civilized.

3. The environment is finite, species have particular adaptations; yet the growth of a population is held in natural check by various combinations of starvation, disease, predation, and conflict.

Pesticides have saved countless lives through control of malaria, cholera, typhus, and Rocky Mountain spotted fever. Pesticides have saved crops and livestock valued at billions of dollars each year.

But, DDT in .001 percent parts per million can be concentrated in algae and retard growth; the shrimp population which feeds on algae can be immobilized by six to six parts per billion; it is absorbed in the egg yolk of fish as witnessed by the massive kills of Coho Salmon in Michigan. When leaves from an elm sprayed by DDT are eaten by worms, the chemical accumulates in their tissues and eventually kills birds which feed on the worms.

4. Man, as dominant, has conquered or is conquering his natural predators and is combating disease.

Typhoid, diphtheria, polio – these killers of children are museum pieces, or could be whenever we would wish.

5. Reproduction of organisms, including man, proceeds geometrically.

From the beginning of time, we find an increasing growth of population. By 1850, mankind numbered one billion. In 1920, 70 years later, it had doubled. In 1955, it was three billion. By last year, the world's population had grown to four billion. By the end of this century

we shall be competing for food and fiber with six to six and one-half billion other people.

What will this rise mean in terms of the number of homes, incinerators, garbage, and automobiles? At what point will all the major cities of the United States be covered with smog?

6. The problem of increase in population cannot be solved by increases in the production of food.

Our present store of food cannot feed the total increase of peoples over the world.

7. Biological evolution is the transmission and transmutation of genes or DNA. For man this is no longer in effect. Operating in its stead is cultural evolution, the transmission and transmutation of knowledge and values.

Man's technology is a function of the cultural evolution, but so are his knowledge and values. We have biochemical means and biological means of controlling reproduction. Therefore, the biological checks on population which man has removed can be replaced by a cultural check consciously controlling reproduction.

8. Natural and cultural selection together determine which species shall survive.

We have saved the bison; we are trying to save the whooping crane and the bald eagle. We destroyed the passenger pigeon, the dodo; we have almost destroyed the otter. We may save the sequoia, the salmon, the elephant. Why not also save man?

9. There is some reason to speculate that small colonies of Homo sapiens may escape the solar system in the distant future.

Man has stepped on the moon. But this hegira comes too late for the present dilemma posed by:

(a) The threat to survival from environmental hazards like air pollution, accidents, drugs, pesticides, and radiation,

(b) The race between the present unprecedented rate of population growth and the world's food supply,

(c) The difficulty of providing health care services to a growing need and demand, and

(d) The need for an environment that offers man "quiet, privacy, independence, initiative, and open space."

10. The concepts and values man accepts and imposes on his behavior function critically in the natural and cultural selection of which living things shall survive, including man himself.

Technology is here to stay. Realism forces us to conclude that we cannot return to a primitive paradise.

11. The rational and hopeful solution is that man may seek a culture relevant to the modern century, make his technology servant instead of master, control his population, and develop the factors which can make his environment sanative and fit for all life.

We require global policies on resources and population; we also need a global environmental bill of rights.

12. There is still time to develop a sanative environment. But, the data on population and resources indicate that time—like all our resources—is in short supply.

13. Therefore, it seems we have reached a cultural and biological point of no return. The time to press for the sanative environment and for an enforceable environmental bill of rights is irrevocably now.

I turn to the *how* in achieving a sanative environment. Our major tactic should involve interposing evidence, reason, judgment, and compassion between the impulse to act and the action. There exist tons of data on cleansing the environment, replenishing it, and living within its limits. When are we to use this knowledge?

But then, who buys and drives cars, consumes gasoline which requires drilling in off-shore areas? Who thereby adds to the nitric oxide and other pollutants in the air?

Who is reponsible for the smog and the use of pesticides to destroy rodents, insects, or fungi?

Who builds houses and cements the driveways and the sidewalks?

Who affirms that the valley of the river belongs to the river and then builds houses in the river valleys?

Who uses non-biodegradable detergents? Who sends effluents into our lakes and rivers? Who throws beer cans into trout streams? Who uses incinerators? Who is responsible for utrophication and for biological magnification?

Who is responsible for the fact that, in a central portion of Lake Erie covering some 2,500 square miles, there was no dissolved oxygen? Who uses more than 700 million pounds annually of pesticides and agricultural chemicals numbering some 45,000 varieties? Who put DDT residue in the penguins of Antarctica? Who will be required to furnish the 100 billion in dollars over the next decade to cleanse the home he has fouled?

Nature's own controls are not helpful; nature destroys as whimsically as man does carelessly. Centuries before man seriously tampered with nature through modern medicine, between 1347 and 1351, the Black Death or Bubonic Plague wiped out 75,000,000 people in Europe. History records numerous other types of plagues and natural disasters that have periodically destroyed various forms of life and changed the face of the earth. Most of this, I remind you, was long before man and his new technology interfered with the balance of nature.

I would suggest that, in dealing with the *how* of politics, we deploy a strategy of reasonableness in which the industrialist, too often referred to pejoratively by the environmentalist, is not always charged with all the crime while his adversary holds all the virtue.

The industrialist produces mainly what we want. It is, therefore, essential that the new politics of conservation employ those tactics and strategies which give equal participation at all levels to those

who use the resources, those who produce the products of civilization, and those who espouse the ethics which will preserve these products.

As a case in point, we are trying to develop an ecumenical congress which would bring conservationists together with industrialists in a dialogue, at all levels, to inform conscience and reform practice. The effort has so far failed because a residue of mutual distrust exists between both factions.

Conservation needs both short- and long-range policies.

For the short-range part, we should continue to register responsible and smoldering indignation. Such indignation implies personal involvement in conservation. Simple devices like carpools will help, for example, until automobile manufacturers agree to meet their responsibilities. Protests to industrial concerns packaging "nonreturnables" or letters to government officials—if done in sufficient numbers—have their effect. To act to conserve is to act politically.

Over the long-range:

(1) Begin a research program demonstrating effective uses of the environment to sustain mental and physical health. It is not enough to invoke a religion of the out-of-doors; there must be evidence. It is not enough to say that a child who has been bred in the out-of-doors loves the out-of-doors.

(2) Take a critical look at educational policy. It seems clear that science ought to give the child an insight into ecology and ecosystems, but science cannot propagandize for the variety of conservation programs. Conservation is an ethic; it is a value. Belief in conservation comes out of the values which are part of the human use of human beings and are, therefore, part of the humanities and the social sciences.

(3) Organize more effectively in order to work in the councils which shape the laws of our country. You—the audience—ought to be the source of powerful supporting documents which legislators can use.

(4) Determine what we shall demand of young people in terms of ethical behavior as they interact with society and with its older organisms.

Our endeavors should not yield to the easiest available forms of evidence. For example, it is clear that the population problems are excessive, but it is not necessarily true that the population problems of the poorer countries cause the degradation of the environment.

I am suggesting nothing less than a complete overhaul of our preconceptions and our conceptions in the light of fairness—or, if nothing else, scientific impartiality.

I turn at last to the *who* in the conservation picture. *Who* gets what, when, and how? At last, the answer is quite clear. Civilization benefits; it is the *who.* But civilized man is fragile. In the words of Adlai Stevenson, a gallant gentleman:

> We travel together, passengers on a little spaceship, dependent on its vulnerable reserves of air and soil; all committed for our

safety to its security and peace; preserved from annihilation only by the care, the work and I will say the love we give our fragile craft. We cannot maintain it half fortunate, half miserable, half confident, half despairing, half slave to the ancient enemies of man, half free in liberation of resources undreamed of until this day. No craft, no crew can travel safely with such vast contradictions. On their resolution depends the survival of us all.

The future of all children is in the hands of all teachers. For me it is a sage conclusion to say: If children are conserved they will conserve the environment. How dispassionate we could be, how truthful, how honest, how evidential, how reasonable if we were to turn to a class discussion on what kind of a world we would want for children. This is the fundamental question for education, not the question of how shall we conserve our environment.

What kind of a world do we want for our children?

PART II:
SCIENTIFIC AND
EDUCATIONAL BASES

Noting that pollution is not a problem in such isolated places as the Amazon jungle, the Andes, or Argentina's pampas, Herminio Lugo Lugo speaks of the great city, a "vortex of steel and concrete," as one symptom of man's environmental excesses. He then speaks firsthand of the educational campaign which his country, Puerto Rico, has mounted to confront pollution.

Stressing man as a part in a larger system, E. Wesley Menzel outlines three broad areas for consideration in designing new educational programs to help man recognize his role in relation to the total environment: (1) using an interdisciplinary approach in learning experiences and coursework, (2) developing an ecological literacy on the part of teachers and students, and (3) singling out for further study those teachers who are becoming ecologically literate and who value an interdisciplinary approach.

Fabio Heredia-Cana draws a strong case against man's failure to understand and respect his environment. "Modern man," he charges, "alters the natural ecosystems, carrying them to an instability." He cites various examples of this violation.

EDUCATION AS CONSERVER IN LATIN AMERICA

HERMINIO LUGO LUGO*

To see how education can help to conserve the natural environment so that man might live peacefully with the ecological system surrounding him, we need to consider briefly the origin of the sickness which afflicts modern society: the deterioration of our environment. There is no doubt that man alone is responsible for the problem of pollution.

Looking more closely, if we agree that a pollutant is a resource which is out of place with regard to the ordered structure of natural systems, we must conclude that the ecological system cannot, under any circumstances, be the cause of pollution. Natural systems form cycles which are completed closed. The regulatory mechanisms are so subtly adjusted that the ecosystem can cope with whatever emergency may arise as long as that emergency is a product of the system itself. Should there be a population explosion of locusts which begins to obliterate every green living tissue in a region, there will come a point in time when life is made impossible for these animals and a majority of them will die before the system can be totally destroyed.

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*Professor of Biology, University of Puerto Rico

Nature's system has several mechanisms adjusted so that nutrients circulate among all its components in an ordered fashion. Energy is continually passing through the various links of the food chains in such a way that the energy garnered by plants is more than sufficient to support all the biotic communities in the area. This *dynamic equilibrium* applies to every system, even one as large and complex as the Amazon Basin in South America. Every unpolluted natural ecological system functions perfectly with its flow of energy, cycle of nutrients, complex food chains, inter-population relationships, and homeostatic mechanisms which help avoid drastic changes thus offering protection for every population of plants and animals which inhabit the area in equilibrating relationship.

The equilibrium of the natural system will survive until the arrival on the scene of an animal who, while neither the greatest in size nor strength, makes the most exacting demands on the environment. If the situation does not accommodate him, then, he changes the system to his liking. I refer, of course, to man. Due to his intelligence and social habits, man can no longer conform to life in the style of Tarzan, enjoying the reign of the jungle and the surrounding ecological system. He must change everything to provide more satisfaction and comfort.

In changing the prevailing environment, man eases his life. But he also introduces changes in the ecological system for which there are no regulatory mechanisms to preserve the equilibrium of the natural system. Such changes might be the increase in garbage and unassimilable materials, the saturation of the atmosphere with venomous gases such as carbon monoxide and sulfur dioxide, the discharge into rivers of industrially-produced chemical substances or household and human waste, or the total destruction of the natural system that results when one builds a city or urban center.

In a natural system all organisms of the same species have the same function within their ecosystem. In the beginning of the human era, man belonged to the natural system, providing himself with his own subsistance and satisfying his basic needs. Because of his outgoing nature, man came to group himself in ever larger units and to lose his ability for self-subsistance as specializations and functions were established. In an Indian village in South America the degree of specilization is minimal the *cacique* (local boss), the priest, the doctor or witchdoctor. The others know how to hunt, fight, plant, and fashion the most elementary utensils for farm and home.

But in the city of Caracas, there are a great number of government administrators, priests and ministers of various religions, and doctors with every variety of specialty; but most people are not soldiers nor do they know how to undertake the planting of agricultural products or even how to hunt. Instead, department stores, great hotels, complex industrial systems appear and the specialization and technology of man stand out.

I consider the most complex creation of modern man to be the great cities with their gamut of social and environmental problems. New York City has become a tremendous ecological monster which depends for its maintenance on ecological systems spread over the farthest corners of the globe. It receives coffee from Brazil, tea from Ceylon, fruit from Central America, and wheat from the Middle Western States. Within its urban boundaries, agricultural products are seldom grown. This vortex of steel and concrete, in contrast to the natural system, is utterly vulnerable; it does not have the necessary homeostatic mechanisms for protecting the system from the problems of pollution which develop as a consequence of more than seven million people living in almost unimaginable density. New York City chokes on its daily production of 1,200 tons of garbage; its air is befouled and makes breathing difficult, especially when a thermal inversion occurs; and the Hudson River has become an enormous disposal for dumping domestic and industrial waste.

The Amazon jungles, the Andes, the immense pampas of Argentina have no such problems of pollution nor will they have as long as man does not tamper with their natural systems.

In this determination to control the environment for his greater benefit, man is destroying the surrounding environment on which he depends for his subsistence and everything seems to indicate that he is on a suicidal course. How is one to avoid this suicide of human race? *Only with a massive educational campaign can man return to the natural ecological niche to which he belonged at the beginning of his stay on earth.*

The educational campaign against pollution must focus on every activity in society in order to bring the message to each one of its citizens. I cite one example which I know firsthand. Puerto Rico's educational campaign is being coordinated to try and remedy the environmental pollution of our natural systems. Even though on our island the struggle has scarcely begun, we are already seeing a ray of hope and action in the form of the cooperation being offered by government, private enterprise, and civic organizations, each of which has gathered together technical experts to confront the great pollutional monster.

At the direction of the governor of Puerto Rico, the legislature is creating the Environmental Quality Commission composed of the secretaries of Health and Public Works, the director of the Planning Commission and three private citizens appointed by the governor. By law this commission has broad powers to provide controls for the environment and our natural resources.

Under the Department of Public Works, three programs are proving valuable in preserving our environment:

(1) Organizing the First Youth Congress to familiarize 200 junior high school students with the environmental situation. At the initiative of these students, every town in Puerto Rico is organizing a

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Friends of Pepito Pelicano Club to plant more trees, set up aquariums, promote gardening in our cities and rural areas, conserve natural forests, and generate interest in the environment;

(2) Creating courses in natural resources for secondary school teachers. Two courses were offered last summer with the aim of encouraging teachers to inculcate a love of nature in their students; and

(3) Holding a conference of some 200 representatives of government, industry, and education to talk over the environmental problems of Puerto Rico.

The Department of Public Works of Puerto Rico has begun a general inventory of the flora and fauna of the island, an extensive oceanographic study of the Caribbean area, and a geologic laboratory—the first of its kind in Latin America—to study the rocks and minerals of the island.

In Puerto Rico we have 670,000 students in the public schools. There are some 300,000 in private schools and 75,000 students at the university level. Our population is one where youth predominates and where the level of education increases from day to day. In a short time, Puerto Rico has succeeded in almost totally eliminating illiteracy.

The Department of Public Education has just appointed a specialist on environmental education who will prepare instructional materials and study units of natural resources for use at every educational level of the public educational system. The ninth grade, for example, now includes a course in earth sciences dealing with the conservation of natural resources. The biology cirruculum in high school uses the ecological approach to the modern BSCS courses. By means of annual science fairs, held in every school, the students are encouraged to do projects based on the environment around them.

The University of Puerto Rico offers courses in ecology, taken last year by 225 students, principally based on study trips to various ecological systems such as tropical forests, mangrove plantations, reefs, and sand dunes. At the end of the course, students realized how the natural system functions and how man, who destroys it, can instead cooperate to preserve it. The University plans to offer a course in human ecology which will be open to any student. These activities are supplemented by the offering of advanced courses in ecology, and an M.A. degree offered by the Recinto de Mayaguez in marine biology. In cooperation with the Department of Public Works, the Department of Biology of the Recinto de Rio Piedras plans to offer an M.A. degree in natural resources. The University of Puerto Rico's school of Medicine offers M.A. degrees in Environmental Health and Radiological Health. The university projects itself into the community through its professors who give lectures to various student groups and civic organizations, through its student organizations like the Biological Honorary Society which also runs activities that encourage a love for the natural environment, and through

frequent articles in the press and scientific journals. Similar activities are carried out by the several university centers about the island.

The Federal Forestry Department also participates in this crusade, offering lectures and study trips for various scholastic and civic groups dealing primarily with the preservation of our forests.

The activities mentioned up to now are tied in one form or another to governmental operations. The public, by civic actions, also enters the environmental picture. The Natural History Society of Puerto Rico, the Society of Interested Volunteers for Environmental Defense, and the Puerto Rican Chapter of the Audubon Society are civic organizations dedicated to defending the natural environment through educational activities of great scope and benefit to their participants. The Girl Scouts of Puerto Rico are also undertaking a full program of activities aimed toward acquainting those young citizens with Nature's system. Through summer camps, the youths have received technical instruction from ecologists who have guided them on study trips to tropical forests.

The Puerto Rican Association for the Prevention of Tuberculosis and Respiratory Diseases is also cooperating through its campaign for pure air.

We are learning that it is not necessary to hold a science class to focus on the environmental problem. The language teacher can encourage his students to write essays on the theme; the artist can cooperate to promote an interest in nature through his paintings; the poet's verses can sing of the most beautiful locales; the composer can paint with musical notes the beauties of the environment; the industrialist can try to maintain the air, the water, and the earth in their purest forms, free of pollutants. We may even teach John Q. Public not to throw paper into the streets or onto the highways and to plant trees and decorative plants rather than to uproot or destroy them. Latin America, like the rest of the globe, is not free from the sin of pollution. Neither is it exempt from examining its conscience or from starting an educational campaign for the masses so that the problem of pollution, if it cannot be totally eliminated, might be moderated in such a way that the environment could recover from the intrusion of man and regain the stabilizing adjustments which existed before the great destroyer of nature arrived. To this cause we must all be committed.

EDUCATING TO UNDERSTAND ENVIRONMENT

E. WESLEY MENZEL*

Man does not begin at one point and the environment at another. Rather, man is composed of biological and psychological systems which are influenced and altered by larger systems. He is continuously interacting with physical systems: air, heat, climate; cultural systems: economics, technology, ethics; and biological systems: photosynthesis and food chains. These are just a few examples of mutual interdependence of the cultural, biological, and physical components which make up man's total environment. Preservation of this environment, something we all depend upon and need for living, should be the conscious responsiblity of all societies. These are concerns of a global nature which require political, economic, and educational action.

Educational institutions transmit knowledge and explore cultural heritage. These processes have been generally accomplished in teacher education by presenting students with a large number of liberal arts courses representing various disciplines and selected professional courses related to methods of teaching, foundations of education, and student-teaching experiences.

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Certain components within this model need to be altered. Today's students have a strong social conscience. Some are suspicious of traditional authority; though expressive and permissive in nature, they feel a need for community. They are aware of the complicated systems of knowledge and technology which are altering our entire environment. What new programs, then, can be designed for students by those of us involved in formal education?

We might explore three broad areas of thought as educational means for enabling man to recognize his role within the total environment.

First, learning experiences or course work should be interdisciplinary. Disciplines should be chosen from areas which lend themselves to understanding the A-B-Cs of the environment—abiotic, biotic, cultural. Such areas could be agriculture, other life sciences and physical science, sociology, psychology, and education. Groups or teams of people knowledgeable in their particular discipline could then relate to concerns within the total environment. Rather than learning specific subjects as fragmented and discrete packages of information, students would perceive and internalize knowledge that would be more relevant to human life. Such experience might be called environmental problem-solving. Rather than a new course in ecology, it would be a plan for teachers and students to enter deeply into and search for the relationships among concepts such as evolution, supply and demand, technology, gross national product, radiation, weather, and urbanization.

These concepts are only a few of the possibilities. The outcome of such study is difficult to specify, but one could make an educated guess that values, attitudes, and literacy would be affected. This type of interdisciplinary approach to educating individuals could produce teachers as environmental specialists as well as provide a deeper general education for scores of others.

New programs in science have been developed in the United States which emphasize the processes and skills of scientific concepts. I recently have been involved with retraining science teachers in several of these newer curricula. In most cases, teachers show increasing confidence and enthusiasm as they gain experience developing new teaching styles which stress process and relationships among ideas. Recording the teaching behavior on television tape for the teachers' private viewing enhanced the retraining process.

An interdisciplinary approach to environmental problem-solving could have a unique style. The authority for guiding economic, political, social, and international decisions would come from the data involved and the consequences of various courses of action. Such conjoint activity is characterized by dialogue, trust, and respect and acceptance of differences in the affective and cognitive input. Decisions emerge from a process of joint learning where the focus is on the issues and conflicts at hand—not on the direct status

of individuals involved. Such a learning model demonstrates the virtues of the democratic process.

Developing ecological literacy presents a second challenge to higher education. While this is of a lower order than the interdisciplinary approach it is a prerequisite. Literacy in this sense is to be thought of as primary knowledge. Just as words are necessary for writing sentences, facts are needed to understand concepts.

The total environment *includes* man. His need to control or exploit the surrounding biological, physical, and cultural dimensions has resulted in a disequilibrium. A basic understanding of the content and situation is necessary to prevent continual imbalance of environmental systems.

This summer I conducted an in-service program for teachers sponsored by The National Science Foundation during which we spent several days studying the environment of Long Island Sound, a body of water that separates Long Island, New York, and the state of Connecticut. This area had formerly been a salt water estuary. Bottom samples of heavy oil sludge and mixed clay were taken from the harbor. As the mud was examined, the teachers observed the remains of a shellfish population—primarily oysters and clams. We did not determine how long this biological system had been destroyed. However, teachers saw, touched, and smelled the results of an ecological system that was no longer functioning in an area that one time had produced an abundance of edible shell fish.

Primary knowledge of the basic systems of life leads to intellectual understanding of what causes a healthy natural balance. *We are part of the water cycle—not outside of it.* Similarly, we coexist with many population species. *It is necessary to recognize that our food supply and nutritional requirements are directly related to the larger food cycles in the total environment.*

Relevant teaching materials which develop specific ecological literacy are appearing in greater quantity. Topics pertinent to our daily lives are frequently found in popular weekly and monthly magazines. Studies of a more technical nature are available. Knowledge of the effect of systems on other systems will enable each individual to become increasingly literate as a critical and intelligent voter. Political candidates are being compelled to think about local and national environmental problems. Hopefully, viable programs will occur at the international level.

The Office of Science and Technology recently advised President Nixon to begin legislation that will necessitate long-range planning by utilities producing electricity through burning fossil fuels or nuclear power.

Institutions of higher education have a basic social responsibility for promoting ecological literacy. Knowledge of the total environment is an essential beginning.

A third challenge and perhaps one of the most nebulous stems from the question of environmental values and attitudes. *What educational strategies or experiences can be offered to teachers that will enable them to sense the importance of the total environment?* We cannot affect all individuals. *A more realistic goal is to identify teachers who are becoming ecologically literate and who value an interdisciplinary approach to teaching and learning.* These teachers sense that human beings are a microcosm representative of and interacting with the entire environment.

Sensitively designed educational objectives which allow students to be committed, to be responsive, and to be aware of cause and effect relationships will stress man's need to know about and feel part of the total environment. Strategies and models for developing humanistic values are not easily constructed.

I am beginning some research with preservice teachers which centers around developing deeper humanistic understanding of the scientific enterprise. Selected plays and novels about science and great moments in the history of science are acted out and recorded on audiovisual tape. Students are encouraged to identify with the feeling, attitudes, and perception of scientists interacting first as human beings and second as scientists. Scenes from the life of Galileo and Einstein are two examples of the materials used. Class discussions focus on how scientific inquiry is affected by cultural attitudes and values. More specifically, values are influenced by economics, technologies available, interests of the culture, political motives, and prestige.

Too little consideration is given to teacher education in relation to educational goals oriented toward affective behaviors. *The values we teach are affected by how we were trained and the life styles we have developed through experience. In order to develop humanistic attitudes, goals should be built into educational experiences.*

Attitudes towards the environment are not only affected by our educational experiences in seeking to understand it, but also by how the environment acts on us. Studies of city and town dwellers show that our attitudes towards people are altered by the heterogeneity and density of the city population. Mechanisms for receiving input (stimuli) and handling output (response) within the human ecosystem are regulated by the number and types of people one encounters during a unit of time. An urban environment promotes an overload of inputs. The individuals adapt to the overload by allocating less time to each input; thus one's environmental relationships become more superficial. People are forced to establish priorities for handling input and consequently they are forced to shift responsibility from one person to another. The more selfish and independent people become, the less they recognize their need to relate to each other. Perhaps the pace of life and its deepest values need to be altered. *Man is the key to sensing how we must work towards unifying the environment*

Education is the means for this process. Changes are necessary in programs for preparing teachers. Such changes require altering the structure, content, and process of our educational concept. An interdisciplinary approach alters the organizational structure of the teaching-learning experience. Content would be chosen that supports and enables the learner to become a more literate and knowledgeable individual. The process of caring for and valuing man's biological, physical, and cultural relationships would penetrate education for the understanding of the total environment. I believe that this could affect the quality of life in the Americas.

THE INDICTMENT OF MAN

FABIO HEREDIA-CANO*

Since man began to cultivate the land he has tried to establish parameters and measures such as geographic, climatic, or seasonal bounds to predict the yields of his crops and adapt the better species of plants and domestic animals to the best conditions in the hope that resources would be assured. Farmers in the Nile Valley synchronized with the periodic runovers of the great river; Latin American Indians cultivated the native potato as the basis of their nourishment.

There is no doubt that primitive man understood and respected his environment more than modern man: he coexisted while maintaining the necessary balance and, consequently, the vital stability.

Modern man alters the natural ecosystems, carrying them to an instability. In 1956 cocoa cultivation was begun in Malaysia on a large scale. Towards 1958 the typical cocoa pests began to appear and in two years they had killed 20 percent of the trees. In 1959, fumigation was begun with Aldrin and/or DDT. These substances gradually increased in use, and the situation worsened with the appearances of new pests and an increase in the number of previous ones. In 1961, following persistent ecological studies, fumigation was

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suspended in the middle of the greatest attack of the pests. Why? Entomologists found that the insecticides were not reaching the larvae of the pests which had reacted upon contact by living within the bark or trunk of the infected trees. Meanwhile, the predators and parasites of the pests were being killed by the insecticides.

Upon suspension of the fumigation, the parasites appeared again. On top of such confusion, it was further learned that, in the secondary forest which surrounded the cocoa plantations, there grew a kind of tree which was host to one of the pests. With the elimination of these trees, the control of the pests was completed by the re-establishment of the predator-prey balance, which had been altered by the use of insecticides.

In Israel, irrigation of deserts has demonstrated that crops raised in an artificial oasis are invaded by pests which travel hundreds of kilometers to locate their host plant, hence ruining the harvests. Explanation? The ecosystem has been altered in such a way that the new humidity in an area which has been dry for thousands of years provides perfect micro-habitats for the proliferation of the pests.

In Egypt and Sudan, the erection of dams and the consequent construction of irrigation canals has altered the humidity of an ecosystem previously governed by the periodicity of rains, making it permanently humid—an ideal habitat for the multiplication of the species of mollusks which are carriers of *Schistosoma haematobium* and *Somanaoni,* producers of urinary and intestinal schistosomiasis, respectively, which cause millions of deaths among the inhabitants of these regions. The cases of contagion both in Egypt and in Sudan following the construction of irrigated lands rose. This is a typical case of managing a natural resource—water—without foresight as to the consequences.

Some thirty years ago, English industrialists invested millions of pounds sterling in the plan to establish immense peanut fields in Africa with total failure and the loss of the immense sums invested. This failure was due to the lack of previous ecological studies.

The Firestone Company, in a similar way, invested and lost huge sums of dollars trying to build rubber plantations in the Amazon. They forgot a simple ecologic principle: rubber trees in natural ecologic systems are scattered between other species which act as a barrier and control against their natural pests. A monoculture of the trees, one very close to another, offers unbeatable conditions for the development of pests. A similar case is occurring in some regions of Colombia where there are scattered large plantations of pine trees in order to utilize land useless for agriculture due to its advanced state of erosion. The plantations are being attacked in mass by pests.

As a final example I mention a case which, although small when weighed in its individual magnitude, represents a relation of ecology to management of natural resources. This example can be extrapolated to many similar situations in our countries. It deals with the work

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that Colombian ecologist Dr. Anibal Patino of the Department of Biology of the University of Valle, Cali, Colombia has been developing for years with the hope of saving one of the natural ecosystems still left in the valley of the Cauca river. It concerns a lake – El Chircal – which is fed by the River Cauca in its periodic risings. Interested economists, initially backed by official authorities, caused the owners of bordering lands to begin to dry up the lake. Among other things, the lake served as the only base of sustenance for hundreds of families of fishermen who lived on one specie of fish. This fish was a major source of animal protein supplied to the Caucan valley markets at a low price. To use the words of Dr. Patino: "What has happened now? The flood gates installed to avoid the runoff of water during the risings of the Cauca River have altered the lake's ecosystem in such a way that two-thirds of its surface is covered by floating aquatic weeds. Because there is no current, the weeds cannot travel the principal river bed.

The entire ecologic balance of the lake is menaced. The floating vegetation interferes with the penetration of light making photosynthesis. As if this were not enough, the humic acids freed by the decomposed vegetation color the water with a moderately opaque tone which absorbs the light in the superficial layer. In these arrangements, the formation of plankton is very limited and the biological productivity of the whole ecosystem is drastically reduced. The excessive burden of decomposing organic material falling to the bottom of the water generates a very high demand for oxygen which limited photosynthesis cannot compensate. The atmospheric aireation is poor because the blasarea, masses of floating vegetation, act as a block and the winds do not ripple the aquatic surface.

The documents of Dr. Patino on this palpable ignorance of an ecosystem's ecology which can lead to the system's total elimination as a renewable natural resource and sanctuary of native species of animals and plants are so concrete, logical, and outspoken that in the University of Valle there has been founded a "University Association for the Defense of Natural Resources in the Cauca Valley" with the collaboration of professor and students – all from widely differing careers and academic levels.

We must plan to save natural resources.

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PART III:
CRUCIAL AREAS

Two critical topics receive scrutiny: urbanization and population education. A third paper offers some ideas on materials for population education in the schools.

Paul Peachey traces the rise of the city into urban ferment and the present stage of post-urban development. Man, he contends, does not have a genuine grasp of urban complexity nor does he know its limits. The school is caught up in this post-urban struggle for communal survival or redefinition. The Greeks, Peachey reminds us, disdained the private man who had no public identity. The freedom and the affluence of the post-industrial world, he argues, made possible this type of man whose "idiocy" must be overcome.

Stephen Viederman builds a case that population education is justifiable on strictly educational grounds because "a population's characteristics and changeability touch upon all our lives, whether a country is considered overpopulated or underpopulated." He sees population education "not as a problem to be controlled, but rather as a phenomenon—both social and biological—which must be understood."

Maria T. Cano recommends establishing goals and objectives before the first line of material written for a population education program. She discusses how attitudes can be channeled and the framework of personal and group reference can be used in writing the materials. A multinational collaboration could be arranged, she suggests, between the Latin American countries since they are similar in history, language, and national values.

THE COMPLEX MESS OF URBANIZATION

PAUL PEACHEY*

Human history may be traced as a struggle between country and city. As the term "civilization" suggests, the conflict was unequal because the city was able to stamp its cultural imprint on agrarian peoples, but its dominance was also inconclusive. For many centuries, cities appeared as urban islands in a rural sea, embracing only minority populations. Cities rose and fell; the rural sea remained. Rural space and urban space were clearly differentiated by the wall which separated them.

With the industrial revolution, however, the city finally won. *But for its victory, the city has paid the ultimate price: it has gained the world and lost its soul and its identity.* Historically, as the source of social change, the city could be regarded as an "independent variable." The city was the crucible in which the new man and the new institutions which gave rise to the modern world were fashioned. But until the industrial revolution, the influence of the city was chiefly moral. Only with the development of the industrial technology would that moral influence be translated into the functional interdependence of urban and territorial social systems. Thereby, vast

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societies possessing important urban attributes were brought into existence while the cities proper began to lose their bounded autonomy. Increasingly they were reduced to the position of the "dependent variable," *controlled by forces beyond their reach.*

Some scholars have argued accordingly that the age of the city has come to an end, and they may be right. Others, emphasizing developments such as cybernetics and nuclear power and the social and economic changes associated with these, have characterized our era as post-industrial. Whatever the validity of these views, a profound difference between the pre-industrial growth of cities and the urbanization of entire societies since the industrial revolution is undeniable. In the former instance, "urbanization" meant the transfer of persons, whether individually or as groups, from the rural sea to urban islands. Cities might grow in size and in numbers, but both variables were sharply limited by the existing technology.

Societal urbanization, on the other hand, means the incorporation, and thereby the transformation, of entire populations within given territories into a single industrial economy. To be sure, the population which remains dispersed in low density non-urban patterns does not participate directly in the heterogeneity and complexity of urban encounter. Yet the mass media and the modern modes of physical movement mean that no one need be left behind.

If we are to properly assess the "urban problem" today, it is important to distinguish between the growth of cities and societal urbanization. Although the two phases must be seen as reciprocal phases of a single world-wide process, their social consequences differ markedly. In the former phase, the power of the city grows; in the latter, though the size of the city settlement may increase vastly, its relative power declines. Similarly, in the first instance, the important displacements are personal and familial; in the latter, institutions and collectivities are enlarged and regrouped, though personal or familial disorganization may likewise occur. For both persons and social configurations, the scale of activity enlarges indefinitely. The enlargement of scale and the increased complexity of networks tends to outrun the capacity of mind and psyche. Men are overwhelmed by constellations of power well beyond their range of vision and control.

When we look at the life situation of the majority of the human population today, however, it is evident that the proclamation of the victory of the city over the country is still premature. While uniformly accurate means of measuring and counting do not exist, perhaps no more than a third of the world's people live in settlements which can be characterized as "cities" or as "urban." Even in advanced industrial societies where the majority of the pople are classified as urban, large numbers, often the majority, are but a generation or two removed from the soil. The culture, the institutions, the language, and the consciousness—even of the industrial or post-

industrial societies—are still permeated with the idioms of rural-urban conflict. Thus, in effect, *we are still trying to navigate the rapids which historically have separated country from city, though the floods of the post-urban era are rushing downward upon us.*

In today's urban ferment, at least in the United States, these two phases or forces of urban development collide and coalesce. Among those tumbling protesting into the streets, one finds those who have come physically into the *urbs*, into the city as a physical container, but who were never admitted to *civitas*, the city as social reality. These would-be citizens have yet to undergo the early phase of urbanization. On the other hand, there are the children of urban privilege, who long ago entered the city, but who rise now to protest the disappearance of the *civitas*. Those without, seek entry; those within, say with Gertrude Stein, "There is no there, there."

The same confusion appears where the mighty assemble to form policy. Whether it is a question of the underprivileged in a post-industrial society or of the underdeveloped among the society of nations, nothing can be more urgent than the development of those left far behind. On the other hand, the problems confronting advanced nations may be, in the end, even more compelling. Clearly the mismanagement of the vast concentrations of power in these societies has already had disastrous consequences, both for themselves and for the societies, in earlier stages of development. Moreover, the post-industrial territory has yet to be mapped. The developing countries have a number of developmental models from which to choose: the Western European, the Japanese, and the Marxist models in the two versions of Russia and China. However difficult it may be to bring about the modernization of a given society, modernization has already occurred in various forms.

The post-industrial society, on the other hand, has still to be invented. It may well be that the disaffection especially in the United States, as expressed in what has been called the "counter-culture," can best be understood as a reaction to the early displacements of the post-industrial era.

In both phases of urban growth, *the school has been a major tool in directed change.* While many forces of communication and development interact in the process of urbanization, *education is the crucible which prepares rural man to perform the special and diverse rules of urban living.* The extent to which the schools, however, are instruments for the diffusion of social inventions made elsewhere rather than agents of innovation is not fully clear. Cumulatively, the education of increasing numbers of people will produce profound changes in societal structures. But can we expect the schools, at least at primary and secondary levels, to facilitate or to direct a process as vast or sweeping as urbanization? Is not their task to mirror and to transmit the changes as they occur in more profound and complex ways throughout entire societies?

These questions, reaching deeply as they do into the history and the philosophy of education, cannot be answered here. *But they must be asked.*

The urbanization of life, which occurs in clearest form by the transfer of people from the country, entails complex changes at the levels of social relations, personality, and culture. As in the case of international migrations, "naturalization" is a long process, likely to extend over several generations. In-migrants into cities may find themselves deprived prematurely of the sustaining ties of kinship, neighbors, or friends, or of the support of the simple economy and institutions upon which they could rely in the rural setting. On the other hand, they may cling to these at the expense of their incorporation into the new structures or institutions of the city. In any case the transition must be gradual, and various strains arise where, for whatever reason, the needs for gradual transition cannot be met.

Usually, however, the population of a city is highly heterogeneous precisely in terms of the stage of urbanization. A classification continuum might be proposed for ranking of the entire population of a city or a metropolis, ranging from those just arrived from farm or village, with no urban skill or experience, to persons who ancestors may have been urban for 10 generations or more. Often, however, this distinction is buried in the categories of social class or in contrast between ghetto and suburb. Differences arising from length of urban residence are both deep and subtle, though they are subject to modification by other influences as well.

For example, in the United States, the lower the socioeconomic class and the more "rural" the urban resident, the greater the likelihood that the locality or neighborhood figures importantly in the way he organizes his life. In the early stages of urban renewal this fact was not recognized. By the same token, the higher the socioeconomic class and the longer the urban residence, the less likelihood there would be of the immediate locality determining the social space of the person in question.

This question quickly takes collective form. The allocation of the urban residents in the urban social system is widely regarded as a function of the market economy. Though the claims of this theory may be excessive, the fact remains that urban social organization in Western societies presupposes considerable interchangeability among the population. Indeed, this obtains at all levels of the society. Already when the American constitution was being written, there was considerable distrust of special groups such as ethnic groups within the larger society. These, it was thought, would inhibit the achievement of the equality without which the society could not operate. But the question has never been resolved, and to this day we feel deeply ambivalent on these matters. Should public policy tolerate the persistence of pre-urban, communal groupings expressed especially in residential and educational patterns, but intruding on the politi-

cal process as well? Or in urban planning, whether in the renewal of old towns or in the building of new ones, should pre-urban, communal preferences be accommodated at the risk of conflict or disruption within the city?

Beyond these particularities lie the central myths or images of the society which the members share and which express and mediate the core self-understanding concerning the society. In the case of the United States, attention has frequently been drawn to the impact of the frontier, or as others would have it, to the experience of what seemed to be almost unbounded space, on our corporate consciousness. It has even been proposed that in America "space has played the part that time has played in the older cultures of the world." For older societies, in which land had long since been occupied and filled, the tragic load of the past had to be born and resolved; until the end of the nineteenth century, Americans could simply go West when problems seemed untractable.

The rush to the suburbs, the ranch style house, the urban sprawl, the addiction to freeway and automobile—these are hardly accidental developments. A former Secretary of Commerce once complained about efforts to curb the urban freeway program because this threatened "our right to come and go as we please . . . a heritage from frontier days." It takes more than a quotation, of course, even from a former Cabinet member, to establish a point. What does seem clear, however, is that many of our deep and unconscious attitudes toward space, time, resources, and institutions were shaped under circumstances so vastly different that these attitudes are detrimental today. The question confronting educators is *whether such attitudes can be modified in the educational process, or are they imbedded so deeply that only new catastrophic experiences can modify them? Can education directly engage and reshape the unconscious material which unites a society?*

Turning now in the other direction, we confront questions vastly more difficult. Assuming that we could dispose of the pre-urban legacy of culture, institutions, and perceptions, what new images or expectations are to be inculcated? Do we accept an extreme view of the *cultural lag* theory which permits technology to be the pacemaker for change, and which would make the educator an adjuster of culture to that pace? If neither the culture of the past nor the technology of the present is to dictate the destiny of post-urban man, whence shall come the models that are to guide us?

Questions like these are the stuff of conflict in modern societies; they can never be arbitrated by educators or educational institutions alone. If the shape of the post-urban world cannot yet be etched, some problems which require solution can at this point be identified, a few of which lie directly in the path of the educational process. One increasingly urgent task is the education of post-urban man to cope with complexity. It has been demonstrated repeatedly that the

magnetism of opportunity, diversity, and choice has attracted people into cities ever since they arose. The social and cultural heterogeneity found in cities is reflected in the urban personality. The urban person can handle with comfort a greater repertory of segmental roles than can his rural counterpart.

Despite the attractions of heterogeneity, however, Americans have frequently displayed strong ambivalence toward the city. They have sought its advantages without understanding or accepting the full consequences of its complexity. At this very moment of urban unrest, large numbers of Americans seem to draw back, pursuing vainly the simplicity and security which we can never regain. Certainly there are limits to the range of role complexities which the psyche can manage, and the malaise of our time may indicate that these limits are being violated.

On the other hand, the understanding and the management of complexity are in part the functions of socialization and education. The point is not that we should strain the human personality to accommodate a runaway technology. It is rather that *the educational curriculum and experience need systematic and critical testing to see to it that the young, indeed persons of all ages, develop a genuine grasp of urban complexity.* Only when complexity and heterogeneity are understood and embraced can the limits likewise be defined, allowing urban institutions and life styles to develop accordingly.

Role multiplicity, however, is simply the reverse side of the identity question. An overloaded repertory of roles inevitably jeopardizes the core identity of the self, and its isolation from the identity forms matrices of primary and communal groups. As we all know, only the abridging of the pre-urban communal structures—family, kinship, locality groups, and the like—makes modern man available for large-scale, complex social organization. In certain respects, the walled medieval city maximized both communal solidarity and secondary complexity. The large-scale post-urban societies, however, call into question not only the pre-urban communal legacy, which already was attenuated in the city, but the neighborhood patterns and institutions which had achieved varying degrees of viability in the industrial city.

But it is above all the schools which are caught up in the struggle for communal survival or redefinition in the post-urban society. Institutionally a case can be made to use the school as the principal tool in the construction and maintenance of neighborhood, and thus for local control of schools. Yet the resulting homogeneity, which provides a clear anchor for identity at one level, can quickly lead to parochial conflict. *It is precisely such homogeneity of class or race or culture which ill-equips the pupil for life in heterogeneous societies.*

At the structural or institutional level, the symbiosis of homogeneity and heterogeneity in the social environment depends upon the functions of the larger society. These the educational process cannot make or break. The school controversy rages because schools seek or are asked to solve problems which they cannot directly control. But educators can both educate for homogeneity and complexity, and articulate for the larger society the complex problems here at stake. One cannot feel that these tasks have as yet been adequately addressed.

Finally, if the age of the city in its pre-industrial autonomy has passed, the *polis*—that reality created by free men in reciprocal action—cannot be permitted to pass. Now is the time to resist the pressure to have done with the classical legacy in the post-industrial world. This is not a plea for the revival of dead languages in the curriculum, though these surely have their place. We need to reconnect rather with the original understanding of the *polis* which, in the words of Werner Jaeger, gives every man, "besides his private life, sort of second life, his *bios politikos*." True, new spheres have meanwhile arisen between the private and the political. Both the private and the civic or public spheres have been vastly enhanced since the Greek urban experiment. But the Greeks disdained the private man who had no public identity. The freedom and the affluence of the post-industrial world make possible widespread "idiocy" in the ancient Greek sense. Unless the idiocy of the members of affluent societies can be overcome, the outlook is hardly bright. Moralizing, however, will avail but little. It is a question of values and life styles; and, if education were a tool in the urbanization of persons in the early phase of urbanization, it could help pioneer the rebuilding of the post-urban *polis*.

POPULATION AWARENESS

STEPHEN VIEDERMAN*

Speakers on population matters exhibit a strong tendency to begin their talks with statistic-laden statements charting the rapid growth of world population in the last century. They are likely to refer to *the* population explosion and *the* population bomb. Speaking with an air of crisis they chart the perils of overpopulation and *populution*, the term coined to cover the population-pollution interface.

I have no intention, however, to follow this formula in talking about population education. Rather than believe that various population problems do not exist in our societies, I feel that these images of doomsday are not defensible for us in our role as educators.

The aims of education are to increase knowledge and ways of knowing, to develop understanding and awareness, and – hopefully – to help us achieve wisdom in the conduct of our lives, both as individuals and collectively. These aims are shared by the new field that has come to be called population awareness education.

The goals of population education are to develop an understanding of the impacts of population characteristics and processes on national development, both in the short and long run, as well as the impacts on

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the individual and his family. Population education serves a dual purpose: (1) developing an informed citizenry which understands population characteristics and processes as they affect society and which can make responsible decisions of public policy affecting these processes and (2) informing individuals who, with knowledge these processes and (2) informing individuals who, with knowledge and understanding achieved through their education, would be able to make responsible decisions concerning their own reproductive behavior.

Population study involves introducing into the curriculum information concerning population characteristics and the causes and consequences of population change. This implies much more than simply studying birth, death, migration, and growth rates. Among other things, it includes an attempt to understand a wide range of social phenomena like urbanization and the role and status of women, both of which are closely linked with and affected by population. Furthermore, since all demographic processes stem from the behavior of individuals, population study also attempts to elucidate the social and psychological bases for this behavior.

Population awareness education differs from sex education and family life education by its viewing of the individual in the context of the broader society and by relating his actions to this broader concern. This linking of the individual to the broader society is one of the key elements in the entire process of development.

In many countries, population education is being urged as an answer to a clearly defined "population problem." Population education has been viewed as a way to continue planned parenthood past the initial crash program stage.

Without denying the validity of this view, it is too narrow. Population education is justifiable on strictly educational grounds. A population's characteristics and changeability touch upon all our lives, whether a country is considered overpopulated or underpopulated. If it is educationally viable to study animal populations within the biology course of study, then it is equally important that we include the study of human populations in our science, social studies, and humanities curricula. Population education, then, is valid for countries like Argentina and Japan, where there is an assumption that *more* rather than fewer people are necessary in order to achieve an adequate labor supply, economic growth, or other national goals. It is just as valid for countries like India and the United States, which acknowledge in varying degrees population problems.

Once the importance and validity of introducing population education are accepted, the problem of bringing about change in the educational system arises. There are now more than 20 countries throughout the world involved in the development of programs, and the number of approaches is almost as great. The size of the country, the nature of its educational system, its perception of a population

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problem, and the extent to which the impetus for population education comes from either medical specialists in family planning or the educational community itself are important variables in determining what program to establish.

It is important, as with any educational change, that there be a reasonably broad base of support. The workshop/seminar approach has been particularly useful in exposing and refining ideas. For example, within the course of 10 months, during 1969, there were three national conferences in India and many more regional conferences devoted to a discussion of population education. They were sponsored by the Family Planning Association of India, the National Council of Educational Research and Training of the Ministry of Education, and the Central Health Education Bureau of the Ministry of Health. One potentially important result of these conferences was the establishment of a population education cell within the National Council with its own budget and staff to develop materials and plan research and training programs. The conferences also stimulated a wide range of other projects so that today there are probably as many as a dozen groups working individually and cooperatively on material development, teacher training, and research.

In Chile the impetus for the development of population education has come from the Center for Training, Experimentation, and Pedagogic Research affiliated with the Ministry of Education. Their program is far-reaching. As part of a general revision of the entire Chilean school curricula, population-relevant concepts were developed. Materials were then written to include these concepts, wherever appropriate, in the content of the social studies curriculum at the upper elementary and secondary school levels. Additional materials as part of the biological curriculum were also developed. In September 1970, the center held a workshop in Santiago for Chilean teacher trainers from normal schools and universities so they could discuss their progress and plans.

In Colombia, interest in population education has developed both at the University of Valle in Cali and at the Colombian Association of Medical Schools. In November 1970, the association will sponsor a seminar to bring together a group of deans and professors of education and officials of the Ministry of Education for the purpose of reviewing possible programs for future development in Colombia. They will review the effect demographic pressures, resulting from the democratization of education and the presence of larger numbers of school age children, will have on the provision of educational services. The development of population education programs will be discussed as one of education's possible responses to these demographic challenges.

If there is an interest in and support for population education, the next step might be the creation of a population education unit or cell within a country's educational system. This group should define the purposes and goals of the program; coordinate activities to insure

progressive and consistent program development; and plan and facilitate the necessary program development activities—including teacher training, materials preparation, review of existing curricula, program-related research, and evaluation. The group should be made up of professional educators who have developed competency in the area of population and who can communicate with both teachers and government officials.

Once goals and purposes are clarified, the method should be carefully weighed: whether to begin new courses or to plan an infusion of population concepts throughout the school curricula in all relevant subjects and at all grade levels. Although the two approaches are not mutually exclusive and both new courses and infusion can be seen in most national programs, specialists in this field give greater attention to the process of infusion. First, the demands of the traditional disciplines for more time as the boundaries of knowledge are pushed back generally preclude the possibility of adding new courses to the curriculum. Furthermore, population learning will probably be more effective if children are confronted with population-relevant material throughout their school curriculum and during their entire period of formal schooling. Finally, the infusion of population education concepts may help to integrate student learning in a number of other curriculum areas that have perplexed educators over the years. Two examples from the United States illustrate this last point.

International studies designed to increase the student's knowledge and understanding of the world in which he lives have been on the public schools' agendas since the late forties, at least, and a major concern during the last decade. The problem has been to give the student a feeling for and a sensitivity to other cultures. All too often, however, the programs have been tours of exotica. Emphasis has been placed either on one cultural region to the exclusion of all others or on a very broad survey of world cultures with little attention to any one. If the goal is to give the student an insight into how others view the world, neither approach seems sufficient. By making population study the focus of international studies programs, the student will be encouraged to understand the wide range of similarities and differences that exist in the world and the varying roles that politics, economics, culture, society, and religion play in the shaping of policies, attitudes, and actions at the individual and societal levels.

Another task that faces the school is one of encouraging and assisting the student in synthesizing what he has learned and to apply that knowledge and understanding to the real world. Study of the impact of a zero rate of population growth on the society and economy of the United States offers a wide range of opportunities for the student to predict and hopefully prepare for the future. In the past, age pyramids—at least for the ages included in the labor force—have tended to mirror the organization and patterns of upward mobility of industry

and of much of society. When that age pyramid begins to approximate a rectangle, as a result of a zero growth rate, what changes will have to take place within the society as a whole? And what changes may be necessary or inevitable when economic growth, which has been predicated at least in part on population growth, can no longer rely on that factor? Solutions to problems arising from a zero growth rate will not be easily found, but the student's search for understanding may lend relevance and meaning to much else that he has been taught.

When we consider the possibility of infusing population-related concepts throughout the school curriculum, we soon realize that virtually no area of human knowledge covered by the curriculum is excluded. Some brief examples will suffice.

- In art courses, an aesthetic of space could be related to a discussion of population.
- In biology courses, information concerning balanced and unbalanced human and animal populations and the ecology of population can be discussed with great relevance.
- In mathematics courses, various concepts could be illustrated through the use of population data. Concepts of numerical size—hundreds, thousands, millions, and billions—could be taught with population data. The concept of compound interests might be learned from a study of population growth rates.
- In social studies courses, the growth of world population can be traced and the factors which have affected the growth can be discussed in terms of historical and contemporary relevance.
- Differences in belief systems—whether religious, political or social—could be reviewed with reference to how these systems view the origins and consequences of rapid population change.
- Students might be encouraged to study population as a local phenomenon—taking a census of the community, learning of its past growth and future projections, such as the need for new or expanded educational and health facilities, transportation, and housing. They would meet head-on the difficulties of collecting and analyzing data.

Teachers should be introduced to the programs as soon as possible. Once they understand the nature of population study, teachers are perhaps the best qualified to suggest and decide where best to infuse population concepts. It is highly desirable, early in the program, to develop a few teachers who will be population education specialists to work closely with the population education unit within the Ministry of Education. We need not develop large numbers of teachers as population education specialists. Rather, we should attempt to infuse the content of population study into the teacher training curriculum in much the same manner that we are proposing to do in the elementary and secondary schools. Any special methodology that might be developed for population education should be handled

through the training in methodology that teachers now regularly receive. Special problems might be handled through the development of in-service and summer institutes in accordance with demand.

New materials for both teachers and students will have to be developed and existing materials should be revised. A reference book or guide for teachers might include a general introduction to demography and population study as well as basic data and information for lesson planning and classroom teaching.

From the very beginning, research and evaluation should be included as part of the development of any national program. Knowledge of the nature of population learning and the developmental stages of population are of central importance to teachers and curriculum developers. Similarly, it is essential to know at the outset the students' and teachers' knowledge of and attitudes toward population matters. These data are not only valuable to the curriculum planner, they serve also as a baseline for purposes of evaluation.

There is considerable room for cooperation between educators the world over in the development of this new field of education. The ultimate responsibility for the development of a national program, however, must rest with the nationals of the country itself. They must create new materials and programs.

Many of my Latin American colleagues have suggested that population education cannot be introduced in Latin American schools. They argue that the word *population* conjures up images of population and birth control which – for various political, social, cultural and religious reasons – is not a very popular image at this point in history. I submit, however, that *population education views population not as a problem to be controlled, but rather as a phenomenon – both social and biological – which must be understood.* As with all good education it does not teach an orthodoxy, but rather provides the student with ways of knowing and with the known information so that he can act responsibly. Thus, population education is no more nor less sensitive than anything else we may teach in the schools. It differs only in the sense that it may be more relevant to the students' own life, now and in the future.

WHAT KINDS OF MATERIALS FOR POPULATION PROGRAMS?

MARIA T. CANO*

Educational materials are methods destined to achieve a constellation of objectives; since no single piece of material can produce generalized changes, affecting basic attitudes in the reformulating of value judgments the development of systematic instructional materials has come to be considered as a part of the development of curriculum. As a consequence, textbooks are planned in series or systems so that they offer a continuity in message—sometimes graduated in expression and complexity and sometimes articulated by means of stock of permanent values. Some of the population materials are deficient in this aspect, perhaps because they were conceived as emergency materials for isolated courses.

Before writing the first line of a material, the objective should be established. One reason for the success of programmed instruction is the prime consideration of how it contributes to the objective.

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Multiplicity of approaches is another important principle. The same message through multiple approaches reinforces itself, provided the repetition is varied. This saturation of materials has a powerful influence in producing specific changes and also in forming that common depth of familiarity with words and ideas from which the opinion leader takes orientation in order to exercise his influence and produce more complex changes.

When planning the system of materials, the educator should consider how to transmit a basic theme with variations through radio, television, printed material, group meetings, and posters. Learning is easier to achieve when it is associated with motives, opinions, interests, or established practices. During his formation, every individual gathers standards, values, and beliefs and then integrates them into his personality. This structure constitutes part of his being. To disassociate himself from them is like mutilating himself, and for this reason he defends them at all cost.

If the message or motive of learning begins to contend with or disturb his personal structure of values, the subject rejects it; he may even show a type of semi-deliberate incomprehension so that the message does not reach him. On the other hand, if it is in accord with these personal structures, it is easily heeded and accepted.

Nevertheless, at times, a person can act incongruously with his true feelings. When from external pressures or impulse he does something about which he is not honestly persuaded, the human being feels himself tense and perturbed. His actions are inconsistent with his knowledge and opinions; he tries to reduce that difference by approximating his opinion to the action or by changing the action to conform with his opinion.

Cognitive dissonance also functions when the behavior of the subject consists simply in expressing an opinion contrary to what he feels. The subject then tries to reduce his inconsistency by modifying his true opinion. The consequences of these actions are very important for the development, selection, and use of education materials—especially for associated change. We may conclude that, in general, materials are very effective when they reduce cognitive dissonance and somewhat ineffective if they increase it. Furthermore, the subject will reject material that increases dissonance and will search for material that reduces it.

Another guideline for the development of educational materials is an adjustment to the framework of personal and group reference. The message, no matter how objective it appears, only has meaning within the receiver's experience. For us, who come from tropical countries, in which the temperature varies little, and where we use the metric system, the weather bulletin that announces 48 degrees of temperature and winds of 10 miles per hour tells us nothing. We need to translate the 48 degrees Fahrenheit to centigrade in order to have at least a theoretical idea of the cold; the miles to kilometers.

Even then the bulletin tells us little because we have not experienced this knowledge.

This complex of concepts, knowledge, and experiences that constitute the framework of personal reference is the instrument with which the person interprets the message; no communication is effective if it does not have this in mind.

But, besides the framework of personal reference given in large part by school education, there also exists the complex of standards and beliefs of the group to which the individual belongs; and if the message is directed toward achieving an associated or generalized change, it should be channeled through the values of the reference group.

To verify what are the practices, knowledge, and attitudes of the group in relation to the educational objectives that are intended to be achieved is an indispensable step in the development of good materials. Investigations of this type are frequent in population programs. The educator comes to know what ideas of the group favor the programs, which erroneous concepts and superstitions he should combat, and what motives of the group may promote his instruction.

In summary, materials for education of the public should be planned in relation to the type of behavior they are to attain. *Materials for systematic teaching, because of the continuity of the effort and time to which the person being educated is submitted, can be planned according to an analytical criterion of the desired behavior.*

When developing educational materials for population programs, one should heed the principles enumerated here, especially those of subordination to the objective, the channeling of attitudes, and the framework of personal and group reference. Population materials are directed toward remedying an urgent and massive problem involving generalized changes, by nature slow and, because of the problem they concern, urgent.

The Latin American countries, similar in history, language, and national values, can concentrate on preparing groups of materials that might either be common for the various countries or be adapted easily with a few modifications. If a multi-national collaboration were arranged, highest importance could be given to developing high quality materials for the variety of objectives and necessities of these programs.

Every educator knows that the result of education—that which is permanent adoption or true learning and that which implies a generalized change that takes root in the subject and alters his values—is a slow process. *Population problems are urgent.* If we are going to do something, let us do it now.

PART IV:
VIEWS FROM TWO CORNERS

Emphasizing 1970 as an important beginning for environmental education, George E. Lowe cites particularly the Environmental Education Act which was passed and signed into law in the United States Oct. 30th. Environmental education, he emphasizes is "not a new subject to be layered into the curriculum; it is a way of thinking." He envisions "a government-wide environmental education program which will exist in most (government) agencies and affect many programs."

Problems of the environment, argues Edward H. Seymour, are too often viewed as belonging to someone else. He speaks to the reality of recognizing that the needs, desires, and value systems of everyone have contributed to the environmental crisis. In attacking the problem, we need not develop new technology; we can apply the existing one. He depicts industry's side of the problem as multidimensional—as a member of the community in which it operates; as a user of resources of the local environment; as an employer of people who live in the local environment; and as a business which must return a profit to shareholders.

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ENVIRONMENTAL EDUCATION CANNOT WAIT

GEORGE E. LOWE*

Because of our heritage—coming as a people to a new land, entering the wilderness, learning to live and to survive in and with nature—Americans have a long history of understanding nature (through writers like Henry David Thoreau), and of conservation (John Muir), and the growth of a land ethic (Aldo Leopold). Today, as we recognize increasingly the need of a return to nature where we have our historical roots, we find a rationale—sort of combination of science and religion—in great writers and ecologists like Loren Eiseley and Rene Dubos. We are coming back into a realization of our kinship with nature and with the earth.

Historically, though, I believe that some day we and our children and their children will look back upon 1969 as the most important event in the history of *Homo sapiens*. President Nixon called it the greatest event when Apollo 11 landed on the moon. This was, indeed a historic turning, but what I am referring to is not just the landing

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on the moon, or the technological and organizational feat which it certainly was.

The astronauts brought back from the moon more than themselves, more than a few billion-dollar rocks. They brought back a new consciousness and a new awareness of man and of earth and of our place in the universe. The astronauts saw the earth from a new perspective: that all men have common problems and the need to learn to live together on one sphere. They saw this great blue-green-brown sphere we live on as a living entity. Further, they saw that we are all a part of that entity, we are all one living organism, interrelated, interdependent, one.

The first man to walk on the moon, Neil Armstrong, said: "... we the citizens of earth, who can solve the problems of leaving the earth, can also solve the problem of living on earth."

The difficulties of leaving earth and the difficulties of surviving on the earth have given us a new perspective on which lifestyles to select, if we are to continue to survive. Along with the Atomic Age which shook us up and the Space Age which showed us our potentials, we have moved into the Age of Ecology.

Margaret Mead has written about the significance of great numbers of people all over the world viewing simultaneously man's landing on the moon, sharing a common feeling of apprehension and then elation. We, as a people, have a new point of view in understanding problems of *recycling*, and the needs of all living creatures on a living earth. These have all become topics of everyday conservation. They are the topics of people suddenly born into a new world, as Margaret Mead says. Yet some people are, like immigrants from an old world, unable to understand the language or the urgency of the new.

It is in the context of this new view of ourselves and our planet that environmental education must be examined. It is appropriate that this new view comes in the year of Earth Day, April 22, 1970, when students all over the country fixed their minds and concerns on something outside themselves. It was a group of students in the Department of Health, Education, and Welfare, the Office of Education who became a major part of the work force that has shaped environmental/ecological education as we have come to see it.

Of course, for many years, scattered individuals have been developing the concepts of environmental education, but it is this year that people and their governments the world over have begun to *confront* it. President Nixon, of course, gave the initiative to the present U.S. efforts in his State of the Union Message and in signing the Environmental Policy Act in January 1970. Then, the Commissioner of Education appointed a task force to determine his office's responsibilities in carrying out the presidential initiatives. From this activity developed two things: first the Environmental Education Studies Staff in the U. S. Office of Education, which did much of the

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philosophical and organizational spadework, looking toward the passage of the Environmental Education Act;* and second, the passage of that Act itself.

The Environmental Education Act was derived from a spring and summer of hearings in the Senate and House, with scores of top educators, ecologists, and other experts testifying. This act is landmark legislation. The President, in calling for a new approach to education, spoke of the need for environmental literacy. And this, he said, was to come about through environmental education as the means for the reform of American society, of our ways of thinking, and of the education process.

President Nixon, in calling for this new kind of education and reform, knew that the educational process would have to begin first with the lawmakers and then proceed to the administrators. The Act passed the House almost unanimously, with only a few scattered votes against it. It passed the Senate without a dissenting vote.

Now the Environmental Education Act is going to go before the President. When he signs it we can expect an educational process to begin within the bureaucracy so that the budget people, the legislative people, and their program officers and aides can begin to understand environmental education.

Ours is an *ad hoc* office, but we are determined to respond in a responsible way to the direction of our executive and legislative branches. We have been given a responsibility and we intend to deliver.

There is little need to go into the philosophy of environmental education—except to emphasize that this kind of education requires new thinking, decision making, and individual responsibility toward the environment. If you are interested in knowing more about the philosophy of environmental education, the U. S. Office of Education can send you materials.

Environmental education is not a new subject to be layered into the curriculum; it is a way of thinking. It is not just conservation education, resource management, or even nature walks. It is not just about population explosions, nor is it simply sex education. It is all of these . . . and more. It is history, economics, sociology, math, music, and religion. It is multidisciplinary . . . or, more accurately, adisciplinary. It affects most everything.

Environmental education has to do with the quality of life and the reason for life. It is something we shall be learning, from preschool through adult education. It is learned through informal education as well as in classrooms.

The young people have it, not the cop-outs and drug users, but certainly the nonviolent flower children. Most students in high schools, junior colleges, and higher education institutions have already dedicated themselves to ecological lifestyles.

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*Passed by Congress Oct. 13, 1970 and signed into law by the President Oct. 30.

When the Environmental Education Act is signed and funded, guidelines for implementation will follow. We will probably work through our regional offices, finding and replicating imaginative and innovative projects which already exist.

Congress, in passing the law, made clear its intent that an office of environmental education should exist at the level of commissioner. Congressman John Brademas (Dem.-Ind.) expressed the hope that environmental education activities would not be lost in bureaucratic snags. The intent of the Act, in line with the expressed intent of President Nixon, is that environmental education should become the matrix for educational reform. Therefore, the new office will carry the responsibility of recommending and pulling together a government-wide environmental education program which will exist in most agencies and affect many programs. The Manpower Development Training Act, under which the new office must cooperate in training environmental technicians, is but one example.

We look forward to the first steps in administering the program.

INDUSTRY'S SIDE OF THE COIN

EDWARD H. SEYMOUR*

Environment is, by definition, all-inclusive. Every animate and inanimate object has an environment and is part of the environment of every other animate and inanimate object. This is true in all senses – physical, biological, social, political, and economical.

It bothers me deeply when I hear people discuss the problems of environment in terms of "we" and "they" – the "theys" being the creators of pollution and the many other forms of environmental damage and the "we's" being the poor, defenseless recipients of same. A little thought shows that there is no such categorical separation; our problems are the result of the interaction of the needs, desires, and value systems of everyone of us, affected, of course, by the social, political, and geographical dimensions of our lives.

Such thinking bears heavily on *how* we approach our problems. I detect in public thinking today an assumption that environmental problems are something to be labelled, defined, and assigned to appropriate forces or organizations for solutions without necessarily involving participation, decisions, and readjustments of values by every

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individual on this earth. Such thinking, in my judgment, will not lead us to effective, long-lasting solutions.

There is a second major consideration in attacking the environmental crisis: the solution of most of today's problems does not require the development of new technology. The first, and urgent, need is to take the steps necessary to gain thorough application of existing technology. From this point of view, the problems of the physical environment become similar to those of the social environment. Just as we know how to raise food, provide shelter, and prevent disease, we know also how to purify air and water, treat sewage, and dispose of other wastes. We are having to learn rapidly how to realign values so that our economic systems can direct the flow of resources into thorough application of these known skills.

This thought may sound odd, expressed by one whose career has been in technology, and who works for a company that takes great pride in its reputation as a technological leader. But the progress of science and engineering has been so dramatic in the past few decades that there is a tendency to think that normal mechanisms will cure our ills —if the technologists will just pull a few more rabbits out of the hat. Undeniably, the scientist and engineer have been heavy contributors to this misimpression, perhaps through insufficient attention to the question of the relationship of their work to society as a whole. But, in order to solve a problem, we must first understand what it is.

In actuality, new technology is always desirable, and there are areas in today's problems where existing techniques are not very satisfactory, at least in terms of producing results at an acceptable cost level. Even more importantly, there will be a rapidly growing pressure for new methods as soon as the widespread application of current ones has been achieved.

An example can be seen in the case of sewage treatment. Standard treatment today usually consists of so-called primary and secondary treatment, which are respectively a solids-settling step and a bacterial digestion of remaining organic material. The effluent is usually chlorinated to reduce bacterial content and water is then safely returned to source bodies such as rivers. It is now, however, water which meets potable standards. In recent years a considerable amount of research and development has been directed at advanced waste treatment or tertiary treatment. Several possible processes have resulted, but none which are economical enough. So far applications are few.

But let's examine the problem: in a country where rivers represent the main source of water for cities, the growing urban populations obviously will cause the percentage of re-use of water in that river to rise. Getting tertiary treatment systems well developed and in place would seem desirable but not until all of the cities discharging into the river are employing efficiently operated conventional treatment.

Unfortunately, this is not the case today in many of the river basins. No single city can undertake the investment and increased op-

erating cost attendant to advanced waste treatment if large quantities of untreated or partially treated sewage are being dumped upstream into the river. As soon as most dischargers are using good current techniques, though, we will see advanced treatment come into use.

What relationship do the foregoing discussions have to the topic of industry's approach? The significance of these factors becomes strikingly apparent when one tries to define and identify the role and contributions of industry in relation to urbanization and environmental problems.

Industry's problem is multidimensional: it is a member of the community in which it conducts operations; it uses the resources of the local environment. In needing people to conduct its operations, industry must have a concern for the availability of personnel which, in turn, is affected by the individual's environmental concerns. Industry is a member of the national economic and financial community, intimately involved in the assignment of dollar values to the things that we do and do not want. In operating and returning a profit to shareholders it must choose carefully the products or services to be provided customers. Each of these dimensions requires increasingly careful examination in terms of environmental problems.

Consider first *the problems caused by industrial operations, ranging from noise, dirt, and smoke on to the poisonous chemical discharges, solid, liquid, or gaseous, and on to more subtle threats such as radiation*. In the early decades of our industrial era we introduced these hazards, but the less dense concentration of factories and the lack of knowledge of effects of industrial emissions on animal and plant welfare left us with little concern. As a matter of fact, the sight of stacks belching smoke and fumes was regarded approvingly as a sign of prosperous activity.

We know differently now. The vast growth of industrial activity, surrounded by spreading expanses of densely populated urban areas, has reached the point where correction is mandatory but, at the same time, extremely costly. Whether industry has or has not displayed a reasonable degree of public responsibility is difficult to determine The traditionally finely-tuned edge of our competitive economy did not encourage a plant operator to undertake expensive control measures, even if he recognized that a problem existed. Sales depend on price, and profits depend on operating costs plus capital investment. So the driving forces of our economic system have not, in the first instance, encouraged pioneering action in the field of pollution abatement. Yet some responsibility has been evident over many years, ranging from companies which have been most careful to avoid exposing their neighbors to any known nuisance or hazard to those which did not care so much.

The picture is rapidly changing. As air and water pollution codes are formulated and enforcement mechanisms are set into place, even the less responsible are being forced to act – or go out of business. Such

action means inevitably some reduction in profit or increase in price for the investor or the consumer.

The second dimension – *dealing with the availability of adequate personnel to permit operation* – has obvious connections to the impact of industrial operations on the physical environment. People not only must work in the plant; they usually live nearby. Other aspects of urbanization now enter the picture. People need more than a wholesome physical setting; they need access to housing, education, transportation, and a healthy community life. Manufacturing industries who select sites for new operations can no longer base their choices primarily on available raw materials, shipping rates, and energy supplies; and assume that the surrounding community will automatically take care of the human factors of housing, education, transportation, and community life. Planning is going to have to be on a much broader basis, carefully integrated with the regional development planning. Whether the motivation is humanistic or economic makes little difference; the results will be essentially the same in either case – if the job is done right.

The degree to which industry plays a controlling part in setting economic price tags is difficult to determine. Industry can be looked at as a link in the overall economic cycle which is subject to the value scales determined by the overall operation of the cycle. Yet, in the case of the larger industrial entities, it can also be argued that this is one part of the loop where large concentrations of power exist. This may suggest that such points have somewhat greater flexibility, and can act as leaders in setting new trends. Certainly, through their established images and their highly capable advertising skills, they enjoy an unusual position. But even so, they can only go as far as their customers and their shareholders will permit.

The fourth aspect of industrial activity – *relating to the choice of products or services to be offered* – has the same overall restraint as that imposed on the manufacturing operations. While product safety has been a matter of great importance to responsible producers, our appreciation for what is involved here has been increasing by leaps and bounds. Not only has the concern for safety as such been intensified, but the potential for undesirable environmental effects is now receiving increased attention. The automotive exhaust, aircraft noise, nonbiodegradable containers, and countless other problems have been acknowledged to be someone's job to clean up – presumably the manufacturer's. Again, the rate of progress will depend on the costs, both tangible and intangible, and the degree to which all concerned are willing to incur them.

In all of these phases, total interaction is the requisite ingredient which will bring men to a better understanding of the workings of the entire system, of which industry is but one part. Then, and only then, can man reach effective readjustment of his values and regain a balanced relationship with his environment.

PART V:
WHAT SOME HAVE DONE

Many institutions reported programs planned or implemented which covered one or more aspects of the environmental problem. Perhaps the most important question for teacher educators is posed in Richard Gordon Miller's description: "Do we not need teachers who have had some definite training in ecology and who can recognize the various world ecosystems and their basic ingredients?" Further on, he writes, "We believe that the teacher needs not to emphasize pollution in the world. We believe in emphasizing the quality of the environment to show the total natural system of the earth and the close and subtle relationship of its components."

INTERNATIONAL ENVIRONMENTAL EDUCATION

RICHARD GORDON MILLER*

Studies of science and biology for teachers must have new orientation if they fail to relate to the individual as an integral factor in the larger natural system on which life depends. The intimacy of the environment to the individual can be demonstrated to even the youngest of pupils in a few simple experiments and materials which teachers can absorb during in-service instruction.

Yet, is not our need greater than that? *Do we not need teachers who have had some definite training in ecology and who can recognize the various world ecosystems and their basic ingredients?*

Teacher education staffs should include well-trained ecologists who can provide the contents that will give environmental education the validity necessary to satisfy youth in meeting their problems of tomorrow.

When environmental education has been taught in the past, the course has been oriented to resource use, conservation, and natural resources—completely economic approaches. Few, if any, have stressed

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the role of the individual and the community as parts of an integrated working system. But already student and teacher are recognizing that what the person drinks, eats, breathes, hears, and sees has been touched with industrial or urban pollution. *We do not need to teach pollution; of that the individual is already an aware and committed person. He needs to know how widespread and far-reaching the pollution of natural environments is and how total is its threat.* He also needs to be shown how to be his own alarm system in registering concern and recognizing involvement. He should become his own teacher in determining necessary corrective measures. He needs to learn the avenues that he, as an individual and as part of a community, can take whenever a new threat appears in his environment. When no such avenues exist, he should learn how to develop them.

At Foresta Institute for Ocean and Mountain Studies, part of the Environmental Training Center in Nevada, we have worked for 10 years in environmental education. We believe that the teacher needs not to emphasize pollution in the world. *We believe in emphasizing the quality of the environment to show the total natural system of the earth and the close and subtle relationship of its components.* We are teaching what is an ecosystem, how it works as a system, and how man must adjust as a working part, functional and benign, within the working natural system. *This requires professional teacher educators who have had advanced preparation in ecological studies and preferably some experience in ecological field research.*

At Foresta we try to base learning on a strong foundation in scientific concepts: energy conversion, the nitrogen cycle, oxygen transport, hydrological cycle, the Krebbs cycle of elemental exchange into and within the cell are all fundamental to natural systems. We might readily become preoccupied with health measures and concerned about population size or molecular biology. But we try to keep basic. *Too few institutions and schools are examining the world of natural systems, trying to understand the norms and the signs of a healthy ecosystem as a prelude to comprehending the symptoms of distress.* So we try to describe the samples of the natural, unmanipulated, unexploited earth as a healthy basis for the measuring sticks. These measuring controls help man to understand the natural and to adjust his cultures to the ecosystems.

We have been working with groups of children for five weeks of intensive summer study. The younger group ranges from 10 to 14 years; they are working both in basic ecology and in mountaineering ecology. They learn the principles, evidences, tools, and ecological procedures for observing and recording.

Another program designed specifically for high school students of exceptionally high ability introduces them to the profession of ecology and to the problems of the environment. A third group of university undergraduates is studying conservation and ecological regional planning.

In 1969, our methods came to the attention of the Education Commission of the International Union for the Conservation of Nature and Natural Resources (IUCN). We conducted a working session on these themes for the UNESCO International Education Year, devoted to delegates representing national ministries of education. This was the first International Working Meeting on Environmental Education in the School Curriculum. Suggestions growing out of the sessions included these points:

- Reform total curriculum, introducing environmental education as an obligatory and integrated component at all levels in school systems;
- Organize obligatory environmental conservation courses in teacher colleges and elsewhere for preservice and in-service teacher training;
- Establish national councils or other offices within ministries of education for developing and implementing environmental principles;
- Urge national legislation to include obligatory environmental education;
- Make available nature reserves and study areas for teachers and students;
- Provide schools with gardens, living teaching materials in cooperation with parks, nurseries, zoos by creating an establishment to perform these functions.

We are continuing our programs, including a four-week institute for teachers in the summer of 1971. Emphasis will be on content, centering around the junior high grades and involving teachers in large doses of outdoor study. Full knowledge and experience in natural environments are our goals.

MOVING OUT *INTO* THE ENVIRONMENT

J. LEONARD JOHNSON*

One way of looking at a rationale for environmental studies is to see this type of learning experience in terms of the roles it can play in a child's educational life. We can then look upon environmental studies, if utilized by the competent classroom teacher, as playing the following roles:

A. *As a Supplement to Other Types of Learning Experiences.*
   1. Due to the abundance of learning materials presently available, the tendency exists to use the classroom or teaching area as the focal point of the educational experiences.
   2. To make the learning experience as meaningful as possible is one role of the teacher.

B. *As a Means of Developing a Deeper Appreciation of a Child's Own Environment.*

   A study of his own environment before or after studying a foreign one will provide excellent opportunities to draw comparisons and contrasts and thereby develop in the child a deeper appreciation of both environments.

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C. *As a Means of Developing a Better Understanding of the Environment.*
   1. Due to the number of hours children spend in front of the television set each day, we are sometimes impressed with what they appear to know. It is perhaps wise to keep in mind that neither is this knowledge firsthand nor is it selected by the learner. The abstractions obtained in a random fashion from the television set are frequently a poor substitute for the reality of contact with the actual environment as has been called for by such educational notables as Aldous Huxley, Pestalozzi, Piaget, Montessori, and now, Bruner and Ausabel.
   2. Children today do not have the privilege enjoyed by past generations of being able to observe, and frequently identify with a tradesman, or other gainfully employed people in their neighborhood for reasons varying from insurance regulations to the fact that the child's life may be so tightly organized by the adult world that he doesn't have time. Taking the child from the classroom into the real environment will give him a better understanding of how his neighborhood is structured, how it is organized and how it works, linking education with life as it is.

D. *As a Means of Learning More about the Child.*
   1. The shy, quiet child or the noisy troublesome child will frequently appear to change character in an out-of-school setting, giving the teacher an opportunity to observe the child in a new situation.
   2. It is interesting to speculate that perhaps the teacher may change character too and be understood to a greater degree as well.
   3. Perhaps, too, the child will learn something about himself.

E. *As a Means of Enlarging and Deepening the Experiential Base of the Child.*
   1. Perhaps the child most in need of this type of experience is the disadvantaged child. Several results of disadvantaged home conditions can be identified. Researcher Basil Bernstein, in studying the language behavior of families in relationship to the intellectual development of children, distinguished between two forms or types of language – restricted or elaborated. How many of the children in schools have a restricted language pattern, but are taught by a teacher using an elaborated pattern? As well as having a restricted language pattern, this type of child tends to pick up certain personal characteristics (which might be called deficits) such as inferior auditory and visual discrimination and inferior judgment concerning the time. Research by Martin P. Deutsch in 1967 showed that inferiority resulted not from physical defects, but from inferior habits of hearing, seeing, and thinking.
   2. It then follows that, to this type of child, the need for increased encounters with persons, places, and things is considerable.

According to Ausabel, a child who lacks these encounters has undergone a form of academic retardation. If such is true of the disadvantaged child, then a similar increment in the experiential base of the child who is not particularly disadvantaged would be just as desirable.

F. *As a Means of Involving Children in the Processes of Problem Solving and Inquiry.*
   1. The type of learning experiences which are related to our environmental studies program place a high priority on the processes of problem solving and inquiry by involving the students in collecting raw data from the man-made and natural environment, then giving them the opportunity to organize the data into recognizable patterns and relationships from which they can develop their own generalizations and understandings.
   2. The focus of such studies should be outward as frequently as is feasible, concentrating on those parts of the environment which affect the lives of the student population.

G. *As a Means of Involving the Present Generation in the Solution to Our Present Environmental Crisis.*
   1. This might be classed as a rationale superimposed on all the others. The involvement of our present elementary and secondary school population in the current environmental crisis is imperative.
   2. If the solution is to be permanent, then the present educational systems have the responsibility of influencing the values, attitudes, and basic assumptions of society in *relation* to this environmental crisis—a viewpoint capably expressed by Senator Gaylord Nelson in introducing the environmental quality bill in Congress.

RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL EDUCATION

ALAN M. VOELKER*

In September of 1969 the Wisconsin Research and Development Center for Cognitive Learning began the preliminary work for developing curriculum materials in environmental education and for conducting basic and developmental research in this area. The program was a logical extension of the center's previous work in elementary science and efforts of other centers and departments of the university.

The Wisconsin Research and Development Center, funded by the United States Office of Education and targeted toward K-6 grades, focuses upon developing instructional materials and conducting research in learning to improve educational practice, particularly individually guided education. Its activities are concentrated in three major programs.

Program 1, "Conditions and Processes of Learning," has these projects: (a) variables and processes in cognitive learning, (b) motiva-

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tion and individual differences in learning and retention, and (c) role-theory analysis of peer-teaching techniques. Program 2, "Processes and Programs of Instruction," has programs in reading and related language arts, mathematics, and science. Program 3, "Facilitative Environments," includes these projects: (a) preparing personnel for differentiated instructional roles and (b) analyzing the organizational and administrative implications of implementing individually-guided education in the elementary and secondary schools. The three programs and their projects work cooperatively to facilitate the improvement of instruction, learning, and instructional processes at the elementary curriculum level.

The center is interested in this area of environmental education for two reasons: one stems from the nature of the project staff and their connection with other departments of the university and the other from the focus of the center. Both the science education staff and personnel in other university departments have worked closely together over a period of years, keeping as a major concern the advancement of the scientific literacy of children in our nation's schools in understanding the interrelationships of science and society. Since the Scientific Literacy Center at the University of Wisconsin was created in 1964, various studies have been measuring a student's understanding of the interrelationships of science and society. Environmental education is an integral part in any understanding of this interrelationship between science and society.

For some time, the center has been seeking a means of shifting the emphasis of the science program from a basic research project into one of increased emphasis upon development. Correspondingly, the research effort concentrates more on formative and summative evaluation of the developmental materials. Also, there is the opportunity to add a social studies dimension to center activities. A program in environmental education with its broad dimensions of science, social studies, and environmental resources management brings added breadth to the center's instruction and instructional processes projects. This breadth is critical to implementation and facilitation of individually-guided education focus because one major concern is the improvement of interdisciplinary efforts in the elementary school curriculum.

The research projects in Program 1 provide the principal investigators with an opportunity to work closely at the forefront in improving curriculum and instruction in the elementary school. Its project 203 presents a unifying factor for many facets of the research and development effort, particularly in continuing the advancement of the work of the science project, involving social studies and environmental management to emphasize the interdisciplinary nature of the problem and examining broadly the problems of education and the environment.

The center constantly seeks opportunities for short- and long-range impact on elementary school educational practice. We see the environmental education program as a contribution to this goal. Other groups devote large efforts to students in the secondary schools and adults. But, by working with younger children, we can have a long-term payoff. Also, the kinds of center materials are varied and flexible. Environmental education is sufficiently broad and diverse that a wide spectrum of materials can be prepared to allow local curriculum personnel a range of selectivity on local, state, national, and international levels.

Our immediate efforts in environmental education consist of (1) identifying environmental education concepts and issues from science, social studies, and environmental resources management, then analyzing these concepts for examples and non-examples and determining relevant properties for use in designing instructional sequences and materials; and (2) preparing tests of concept mastery for pre- and post-assessment of children's understanding of the respective concepts.

The first instructional product, an ecological reader, will be organized around a major environmental education topic such as electrical power, water pollution, or population. The books will present basic knowledge—facts, concepts, and issues—related to the problem and introduce the student to the broader concepts of consequence—risk and limitation—and the roles they play in decision making at a personal, group, or community level. This series of books will need sufficient flexibility for use in instructional programs in reading, science, social studies, and other areas of the elementary school curriculum.

The second major product in preparation is an activities booklet built around a major reader topic and describing activities—ranging from discussion topics to in-school laboratory activities to immediate community activities to field activities—that children can better understand problems related to the topic. The booklet is designed to complement a reader, but it can also be used directly in teaching children ecological concepts.

Our present research efforts consist of measuring children's understanding of ecological concepts according to concept mastery tests and of looking at children's mastery of specific concepts across disciplines. Projects other than Project 203 are also interested in using instructional materials related to environmental education.

New curricular materials will come from the formative-summative evaluation of the ecological readers in the same areas. Plans have been drawn for developing a wide variety of audiovisual materials to amplify the ecological readers and teach the concepts to children with reading difficulties or those who learn better through verbal means. Long-range developmental plans call for a continuation of

materials preparation for facilitating the understanding of the interrelationships between science, technology, and society.

Test development, a major part of the project's output, will include means of measuring the success of the materials during their formative and summative evaluation. In addition, instruments will be developed to measure children's understandings of environment problems and concepts.

Activities of the Research and Development Center are closely aligned with activities of other centers and departments of the University of Wisconsin. Each principal investigator also is a member of another university department. Thus, our efforts in research and development in environmental education have an influence on our preservice and in-service teacher education program at both the undergraduate and graduate levels. Teachers and prospective teachers in these programs provide project staff with ideas for materials development and research, and also become a ready resource for obtaining appraisal and feedback on versions of materials prior to and during pilot testing. This interaction strengthens the materials' contents and keeps an open channel between the center staff and the children in the schools.

Examples of university groups with which the center has a strong working relationship include the Center for Environmental Communications and Education Studies, The Institute for Environmental Studies, and the Department of Curriculum and Instruction. These cooperative endeavors provide the project with the background and counsel to prepare materials and conduct related research assuring a sufficient interdisciplinary base with aesthetic, economical, political, sociological, and developmental and social psychology dimensions.

INQUIRY APPROACH

RICHARD M. BINGMAN*

During the next few decades, man's survival may depend on how well he can solve some problems largely of his own creation. The solution of a very complex problem like environmental pollution might depend in large part on human ability to work together as well as on the technological concepts and processes employed. Such a problem could best be attacked by teams of persons representing the social, physical, and biological sciences. Each of these persons would carry out a unique, functional role, depending on his background and nature of the problem. Then there are persons who do not become involved directly; but through their indirect voting influence, they provide a climate for solving the problem.

These types of tasks and kinds of involvement place a heavy burden on our educational system.

Most of us would realistically concede that what we often do is not very compatible with reaching objectives we consider important. For example, if we really expect persons to play a role in cleaning

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up the streams, *it is far wiser to develop his values through active involvement rather than by listening passively to a lecture.*

The Inquiry Role Approach was created to involve students actively, individually, and collectively in four-person teams performing differentiated roles. These roles have resulted from a task analysis of the kinds of functions involved in conducting investigations to reach inquiry objectives. The developers of IRA do not separate the functional process from the content: both aspects are interdependent. Inquiry teams of students work on biological problems that represent both the closed and open-ended type, providing ample opportunity for increased application and understanding. It is assumed that the acquired skills, concepts, and attitudes of the student as he interacts with the subject matter and with other students will encourage a greater capability to interact with the social and physical environment. In reality, the two may in practice be inseparable, particularly in the immediate future.

The Inquiry Role Approach is believed by the developers to have much to offer in changing the focus from adult experience to the experience of the student in a learning situation. If the student truly learns how to learn—socially, scientifically, and individually—he can communicate more effectively with his fellow man and many creative means of utilizing human, as well as physical resources, will emerge. The gap between educational theory and practice should begin to close.

PART VI:
DIRECTIONS TO PURSUE

After welcoming remarks, speeches from many vantage points, and discussion sessions on environmental studies in teacher education programs, the basic question of guidelines was approached. The resulting conference recommendations, listed in the following section, reflect a beginning—a point of departure for future action by institutions responsible for the education of teachers.

RECOMMENDATIONS OF THE CONFERENCE

Within the preservice general education program of teachers for all school levels the following experiences are recommended:

1. That the early phases of preservice programs emphasize identification of contemporary environmental problems, resources related to these problems, and ways to use these resources. Every undergraduate should have guided experiences working in social, political, technical, and human agencies. These experiences must help students to explain regional, national, and world environments and their potentials, limitations, and problems.

2. That the undergraduate preservice program should allow for experiences requiring the wise choice of alternatives. Students must be given opportunities to become involved in local environmental problems which deal with *real issues* that involve faculty and students in concrete experiences. For example, the student might work with the college development staff as it plans buildings to assure that the natural beauty of the campus is not destroyed. Environmental study *should not be treated as a discipline* itself, but should be approached from the *problem-solving point of view* and should utilize information and skills from many disciplines.

3. Parallel to and in consonance with the experiences provided for each undergraduate, colleges should provide seminars and/or

work-study groups which will demand that each student develop his own organized set of guidelines and priorities related to the dynamic nature of the environment. Each student must reach his own conclusions about the conflicts that may exist between the needs, aspirations, and desires of individuals and those of society as a whole.

Within the preservice professional preparation of teachers for all school levels the following experiences are recommended:

1. The orientation of courses in the sciences, social studies, and humanities should include contents related to the quality and maintenance of the environment.
2. Program requirements should include exposure to the knowledge, needs, and social value systems involved in environmental decision making that come from the social studies (sociology, political science, rural and urban studies, population dynamics, economics), the humanities (art, architecture, literature), and the sciences and engineering.
3. Individuals should have at least one first-hand experience with an environmental problem. For example, he might study a water pollution, air pollution, human pollution, or resource depletion problem.
4. Schools of education should provide competent instruction related to the teaching of environmental concepts, attitudes, interests, and appreciations.
5. Schools of education must accept the responsibility to spearhead research and to develop materials for use in teaching environmental education in the schools.
6. Environmental education should not be looked upon as a discipline, but rather as an interdisciplinary problem area that has as its ultimate goal the development of attitudes related to the finiteness and interrelatedness of all factors in the environment. For example, man has rights and he has obligations, but he has no absolute possessions; he has the right to use natural resources and an obligation to pass these resources in the best condition he knows to the future inhabitants of the earth.
7. Field study technique should be a part of the early experience.
8. Direct involvement with agencies dealing with social and environmental management and involvement with action programs is essential to help students in understanding the nature and urgency of environmental problems and the dynamics of social and political actions related to the solution of environmental problems.
9. Participation in environmental studies activities should be a part of the practice teaching experience.
10. Teacher educators themselves should become actively involved in the solution of environmental problems, and spill their enthusiasm for such activity over into their interaction with preservice teachers.

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11. There should be provision for the distribution of local and/or federal funds so that groups of teacher educators could be supported to identify specific behaviors characteristic of ecological citizenship.

12. Environmental education programs and activities of the schools of education and other parts of the universities should be centrally coordinated, have a designated leader, and if possible set up an environmental education center.

13. Teacher training institutions should accept the responsibility for preparing personnel who will become teachers of environmental technicians.

14. Teacher training institutions should prepare personnel to serve in the area of adult education related to environmental quality.

Within the graduate and in-service education program of teachers for all school levels the following *competencies* are to be developed:

1. That practicing teachers develop a sense of urgency with regard to the environmental crisis along with an awareness that effective action is possible. This sense of urgency must be channeled to the appropriate level in order to avoid undue frustration, fear, or indifference.

2. That practicing teachers develop a macro-approach to the complexities of the environmental crisis. They should be able to think in global terms and use a multidisciplinary approach to the ecological problem.

3. That the teacher develop an awareness of the need for a valuational system based on human interrelatedness and interdependence, during which hard choices will have to be made and priorities established.

4. That the teacher be effective in promoting learning, including the usual competencies of involving the student and relating the problem to his world, but particularly in terms of:

   a. the ability and willingness to exemplify by his own behavior appropriate action with regard to the environmental crisis,
   b. the ability to measure the achievement of the student's behavioral changes in the light of environmental goals, and
   c. the ability to extrapolate from present data and to absorb new knowledge and adapt new teaching methods as new environmental challenges arise.

The above competencies may be developed through the following activities actively involving the teacher:

1. A series of formal direct experiences, with expert help, in environmental problem situations;

2. A multidisciplinary approach to bring out the globality of the ecological problem, no matter what the specific case, sample, or discipline may be;

3. The initiation and carrying out of studies involving a multidisciplinary approach to the solutions of local environmental problems;

4. The expansion of the information network through participations in periodic formal group interaction at local and regional levels.

The above experiences can be implemented both through the university and through local educational systems.

The preceding recommendations imply the need to offer special prestige and funding to educational studies aimed at formulating principles for reorienting the education process. It must be oriented toward assuming biological survival, ecological equilibrium, and socioeconomic balance.

PART VII:
EPILOGUE

In closing the AACTE/OAS conference, Galo Plaza, secretary general of The Organization of American States, spoke of the breadth of the problem:

> The magnitude of the environmental crisis has only recently begun to be felt in Latin America. We used to think that our resources were practically unlimited, and that only industrialized nations like the United States were plagued by pollution. In recent years, however, that attitude has been changing. . . . Pollution may be more accute in some parts of the New World than in others, *but no one country is immune to it.*

His colleague Edward C. Pomeroy, executive director of the American Association of Colleges for Teacher Education, then emphasized the diverse people who must confront the environmental education challenge: "The solution of environmental problems does not just rest with the professional educators, nor with governmental representatives solely. It does not rest alone with scientists or social scientists. *It requires the expertise of many professionals.*" He stressed the interrelationships which had been begun during the conference.

Both remarks speak to the months and years ahead.

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